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Airfield Pavement Evaluation, Gray Army Airfield, Fort Lewis, Washington

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and Dan D. Mathews

August 2002

Geotechnical and Structures Laboratory

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Final report

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Contents

Preface

The purpose of this report is to provide an assessment of load-carrying capacity and condition of airfield pavements at Gray Army Airfield (GAAF), Fort Lewis, Washington. This report provides data for the following:

a. Planning and programming pavement maintenance, repairs, and structural improvements.

b. Designing maintenance, repair, and construction projects.

c. Determining airfield operational capabilities.

d. Providing information for aviation flight publications and mission planning.

Users of information from this report include the installation's Directorate of Installation Support (DIS), engineering design agencies (DIS's, U.S. Army Corps of Engineers), Airfield Commanders, U.S. Army Aeronautical Services Agency, and agencies assigned operations planning responsibilities. Information concerning aircraft inventory, passes, and operations shall not be released outside U.S. Government agencies. This report satisfies requirements for condition inspection and structural evaluation established in Army Regulation AR 420-72 (Headquarters, Department of the Army 2000) and supports airfield survey requirements identified in Army Regulation AR 95-2 (Headquarters, Department of the Army 1990).

The Army Airfield Pavement Evaluation Program is sponsored and technically monitored by the U.S. Army Corps of Engineers, Transportation Systems Center (CENWO-ED-TX), located in Omaha, NE. The U.S. Army Forces Command, Fort McPherson, Georgia, provided funding for this investigation.

Personnel of the U.S. Army Engineer Research and Development Center (ERDC), Geotechnical and Structures Laboratory (GSL), Vicksburg, MS, prepared this publication. The findings and recommendations presented in this report are based upon pavement structural testing, data analysis, and condition survey work at GAAF. The required field testing was conducted in October 2001. The evaluation team consisted of Messrs. Robert W. Grau, Richard E. Bradley, Dan D. Mathews, and Patrick S. McCaffrey, Jr., Airfield and Pavements Branch (APB), GSL. Messrs. Grau, McCaffrey, and Mathews prepared this

publication under the supervision of Mr. Don R. Alexander, Chief, APB; Dr. Albert J. Bush III, Chief, Engineering Systems and Materials Division; and Dr. David W. Pittman, Acting Director, GSL.

At the time of publication of this report, Dr. James R. Houston was Director of ERDC, and COL John W. Morris III, EN, was Commander and Executive Director.

Recommended changes for improving this publication in content and/or format should be submitted on DA Form 2028 (Recommended Changes to Publications and Blank Forms) and forwarded to Headquarters, U.S. Army Corps of Engineers, ATTN: CECW-EWS, 441 G Street NW, Washington, DC 20314.

Executive Summary

Personnel of the U.S. Army Engineer Research and Development Center (ERDC), Vicksburg, MS, conducted the field testing at Gray (GAAF), Fort Lewis, Washington, during October 2001. The structural capacity and physical properties of the pavement facilities were determined from nondestructive tests using a heavy weight deflectometer (HWD) and from measurements taken in previous studies. A visual inspection was also conducted to establish the condition of the airfield surface, which does not necessarily correspond to its load-carrying capacity.

The results of the tests and visual inspection reveal the following:

a. The primary airfield pavement facilities and their assigned Pavement Classification Number (PCN) are shown in Illustration 1.

b. Two of the three runway features (R1A and R3A), twelve of the fifteen taxiway features (T1A, T3B, T4B, T5A, T6A, T7A, T8B, T9A, T10A, T13B, T14B, and T15B), and fifteen of eighteen apron features (A1B, A2B, A3B, A4B, A5B, A6B, A7B, A8B, A9B, A10B, A12B, A14B, A15B, A16B, and A17B) are structurally inadequate to withstand the projected fixed-wing day-to-day mission (i.e., peacetime use) traffic. All pavement features (T12B, A11B, A13B, and A18B) that were evaluated for rotary-wing traffic are structurally adequate to withstand the projected CH-47 traffic.

c. Installation Status Report (ISR) ratings for the airfield are shown in Illustration 2.

d. Approximately $180,000 (FY02) for repair is required to improve the surfaces of one taxiway feature (T11B), and three apron features (A10B, A11B, and A18B) to meet the minimum PCI requirements.

e. In planning structural improvements and/or reconstruction requirements, it should be recognized that UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001b) specifies that the following pavements be rigid pavement: all paved areas on which aircraft or helicopters are regularly parked, maintained, serviced, or preflight checked, on hangar floors and access aprons; on runway ends (305 m (1,000 ft) of a Class B runway; primary taxiways for Class B runways; hazardous

cargo, power check, compass calibration, warmup, alert, arm/disarm, holding, and washrack pads; and any other area where it can be documented that a flexible pavement will be damaged by jet blast or by spillage of fuel or hydraulic fluid.

f. Overloading the pavement facilities may shorten the life expectancy.

Additional details on structural capacity, surface condition, and work required to maintain and strengthen the airfield are contained in Chapters 2 and 3 of this report.

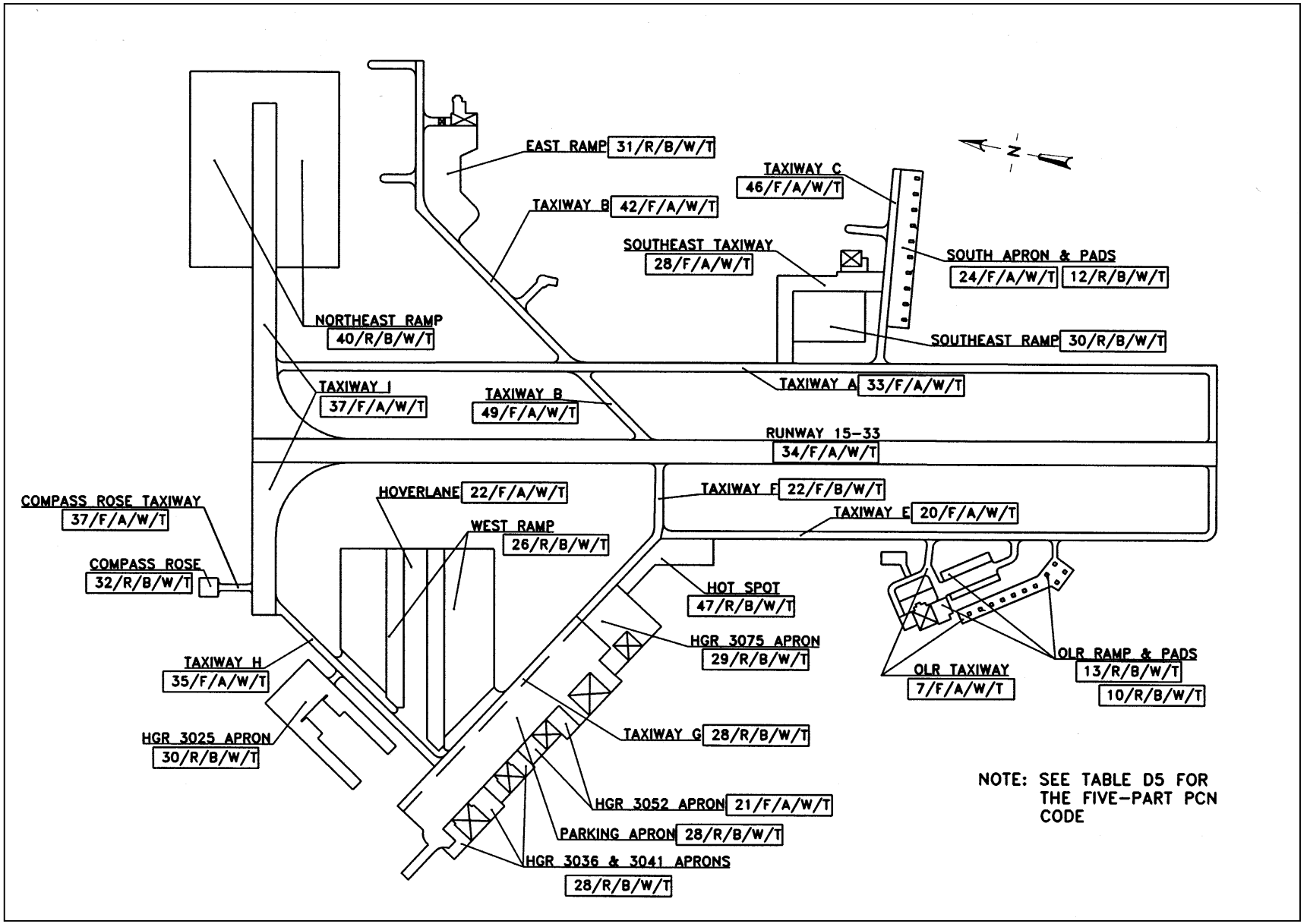


Illustration 1. Airfield Pavement Evaluation Chart (APEC)

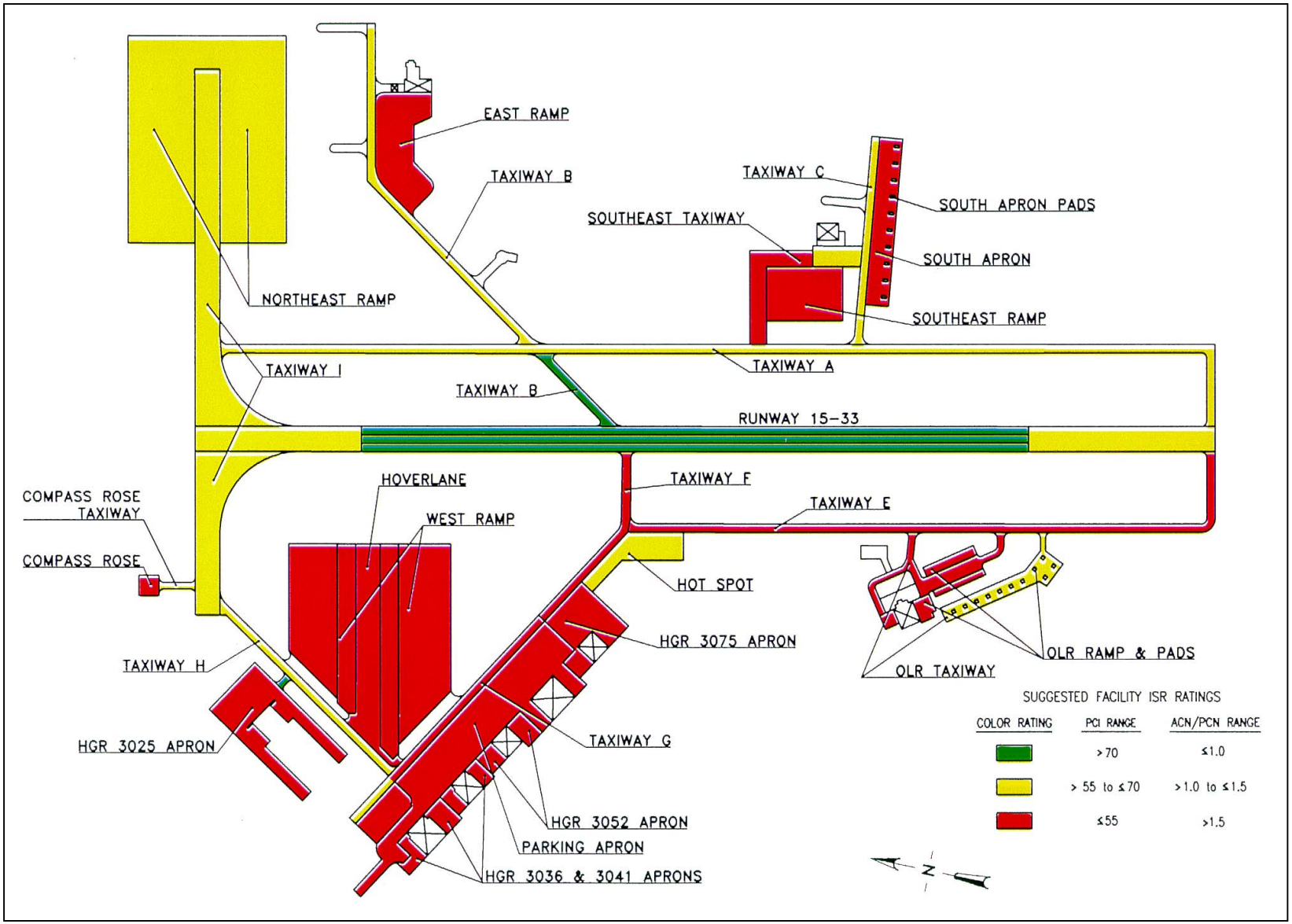


Illustration 2. Airfield pavement ISR ratings

1 Introduction

Background

In May 1982 the Department of the Army initiated a program to determine and evaluate the physical properties, the load-carrying capacity for various aircraft, and the general condition of the pavements at major U.S. Army Airfields (AAFs). This program was established at the request of the Major Army Commands (FORSCOM, TRADOC, and AMC). Headquarters, U.S. Army Corps of Engineers (CECW-EW) sponsors a program for periodic evaluation of Army Airfield facilities in accordance with Army Regulation AR 420-72 (Headquarters, Department of the Army 2000). All Category 1 AAFs and instrumented U.S. Army Heliports (AHPs) are included in the CECW-EW program. The evaluation of the airfield pavements was performed to determine the structural adequacy of the existing pavements to accommodate mission aircraft. Results of this evaluation were also used to identify maintenance, repair, and major repair work requirements and to help establish Installation Status Report (ISR) ratings. The U.S. Army Forces Command, Fort McPherson, Georgia, provided funding for this investigation. Results of this investigation will provide current information for designing upgrades to the pavement facilities.

Objective and Scope

The primary objectives of this investigation were to determine the allowable aircraft loads and design traffic, and to identify maintenance, repair, and structural improvement needs for each airfield pavement feature. These objectives were accomplished by:

a. Obtaining records of day-to-day traffic operations from the installation Airfield Commander.

b. Conducting a structural evaluation of the airfield pavements in accordance with UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force 2001a) using the nondestructive testing device.

c. Performing a condition survey to determine pavement distresses (type, severity and magnitude) in accordance with ASTM D 5340-93 and using analysis features of the Micro PAVER pavement management system.

The results of this study can be used to:

a. Provide preliminary engineering data for pavement design (Appendixes A and B).

b. Assist in identifying and forecasting maintenance and repair work, the preparation of long range work plans, and programming funds for the various work classification categories (Appendixes C and E).

c. Determine type and gross weights of aircraft that can operate on a given airfield feature without causing structural damage or shortening the life of the pavement structure (Appendix D).

d. Determine aircraft operational constraints as a function of pavement strength and surface condition (Appendix D).

e. Determine the need for structural improvements to sustain current levels of aircraft operations (Appendix D).

f. Summarize results for ISR ratings (Executive Summary).

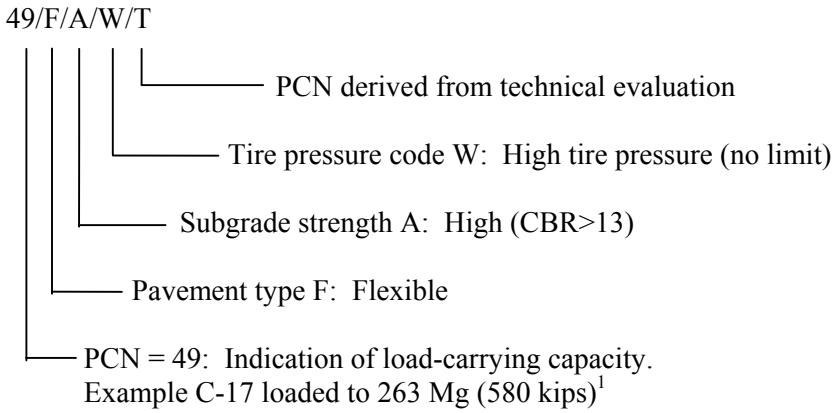
Chapter 2 of this report includes the results of the aircraft classification number-pavement classification number (ACN-PCN) analysis for use by U.S. Army Aeronautical Services Agency (USAASA), the airfield commander, and Deputy Chief of Staff for Operations and Plans (DCSOPS) personnel. Chapter 3 contains maintenance, repair, and structural improvement recommendations for use by DPW personnel and design agencies. Chapter 4 contains conclusions and recommendations in summary form. Detailed supporting data are provided in the appendices.

2 Pavement Load-Carrying Capacity

General

The load-carrying capacity is a function of the strength of the pavement, the gross weight of the aircraft, and the number of applications of the load. The method used to report pavement load-carrying capacity is the ACN-PCN system as adopted by the International Civil Aviation Organization (ICAO). The United States, as a participating member of ICAO, is required to report pavement strength in this format. The ACN-PCN format also provides the airfield evaluation information required by Army Regulation AR 95-2 (Headquarters, Department of the Army 1990).

The ACN and PCN are defined as follows: The ACN is a number which expresses the relative structural effect of an aircraft on both flexible and rigid pavements for specific standard subgrade strengths in terms of a standard single wheel load. The PCN is a number which expresses the relative load-carrying capacity of a pavement for a given pavement life in terms of a standard single wheel load. An example of a PCN five part code is as follows:



[1] Most of the dimensions and measurements reported were obtained in non-SI units. All such values have been converted using the conversion factors given in ASTM E 621.

The system works by comparing the ACN to the PCN. The PCN is a representation of the allowable load for a specified number of repetitions over the life of a pavement. The ACN is a representation of the load applied by an aircraft using the pavement. The system is structured such that an aircraft operating at an ACN (applied load) equal to or less than the PCN (allowable load) would comply with load restrictions established based on a specified design life for the pavement facility. If, however, the ACN (applied load) is greater than the PCN (allowable load), the specified design life will be shortened due to this overloading. Pavements can usually support some overload; however, pavement life is reduced. As a general rule, ACN/PCN ratios of up to 1.25 have minimal impact on pavement life. If the ACN/PCN ratio is between 1.25 and 1.50, aircraft operations should be limited to 10 passes, and the pavement inspected after each operation. Aircraft operations resulting in an ACN/PCN ratio over 1.50 should not be allowed except for emergencies.

Load-Carrying Capacity

The first step in determining the load-carrying capacity of the pavements at Gray (GAAF), Fort Lewis, Washington, was to estimate the traffic to which the airfield will be subjected over the next 20 years. The traffic mix established for the primary airfield fixed-wing facilities; Runway 15-33, Taxiways A, B, C, E, F, G, H, and I, Compass Rose and taxiway (A17B and T15B), Southeast taxiway, and all parking aprons/ramps with the exception of the South Apron pads and OLR Ramp and pads is shown in Table A4. Based on this mix, the critical aircraft operating on the airfield was determined to be the C-17 aircraft at a design pass level of 1,000 for both AC and PCC pavements as shown in Table D1. All rotary-wing facilities were evaluated for 48,500 passes of a CH-47. Using this traffic information, and results of the data analysis, the ACN value for the critical aircraft operating on the GAAF pavements was determined. The operational ACN for the airfield is 49/R/B/W/T for the rigid pavements and 49/F/A/W/T for the flexible pavements. See Table D5 for description of the five component ACN or PCN code. The numerical ACN values calculated for the critical aircraft operating on AC and PCC pavements on each of the four subgrade categories are presented in Table D2.

The critical PCN value for each airfield facility is presented in the Airfield Pavement Evaluation Chart (APEC) in Illustration 1. A summary of allowable loads and overlay requirements determined for the critical aircraft and its design pass level is shown in Table D3. PCN codes for the controlling feature of each facility are presented in Table D4. The effects of thaw-weakened conditions were not considered because of the coarse nature of the subgrade material, short duration of freezing temperatures, and no visible effect of frost damage detected during this investigation.

The number of passes of mobilization and contingency aircraft loadings that could be sustained by each facility is dependent on the ACN of the aircraft and the critical PCN of the facility. During wartime, many aircraft are allowed to carry heavier loads than during peacetime. This allowance means that the aircraft

would have a higher ACN because of the higher loading and would cause more damage per pass than in peacetime. Also, under some contingency plans or during emergencies, heavier aircraft than those in the traffic table, see Table A4, could be considered for using the airfield pavements. These heavier aircraft would generally have higher ACN values and cause more damage than those normally using the airfield. The operational life of the pavement will be reduced if it is subjected to aircraft loadings having ACN values higher than the PCN of the facility. An example of a procedure to determine the impact of mobilization and contingency aircraft operations is presented in Appendix D.

3 Recommendations for Maintenance, Repair, and Structural Improvements

General

Recommendations for maintenance, repair, and structural improvements are based on results from both the structural evaluation (Appendix D) and the pavement condition survey (Appendix C). Either or both the evaluation and/or the survey may indicate that a particular feature needs repair and/or improvement. If the pavement condition index (PCI) is below the required value contained in Army Regulation AR 420-72 (Headquarters, Department of the Army 2000), the pavement needs maintenance to improve its surface condition. If the ACN/ PCN ratio determined for the critical aircraft is greater than one, the pavement needs structural improvement. Where both evaluations indicate improvements are needed, the recommendations are made such that the repairs to the surface are those needed until the structural improvements can be made. If the structural improvements are made first, the surface repairs may not be necessary. The PCI, ACN/PCN, ISR rating, and recommended general maintenance alternatives for each feature are shown in Table 3-1, the Airfield Pavement Evaluation General Summary. Specific recommendations for maintenance are identified in Table 3-2.

The ISR is an information system designed to help the Army monitor some of the basic elements that affect the quality of life on installations. The ISR also supports decision-making by giving managers an objective means and a common methodology for comparing conditions across installations and across functional areas.

Recommendations for structural improvements have been defined in terms of overlays in this report. In some instances, overlays may not be the most cost effective or best engineering alternative for pavement strengthening. It should be noted that the overlay requirements shown in Table 3-2 were determined based on representative conditions at the time of testing and should be considered minimum values until verified by further investigation. These overlays should be used as a guide when programming funds for design projects. Prior to advertising an improvement project, a thorough pavement analysis and design should be

completed to select the most cost-effective improvement technique. All designs should be reviewed by the U.S. Army Corps of Engineers Transportation Systems Center to ensure that they are in accordance with current design criteria.

Recommended overlay thicknesses follow the criteria for minimum thicknesses contained in UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001b). Where calculated thicknesses are greater than the required minimum thickness, the values were rounded up to the next higher 13 mm (1/2-in.).

Maintenance and repair (M&R) recommendations are based on the changes needed to provide the minimum required PCI. AR 420-72 (Headquarters, Department of the Army 2000) states that installation airfield pavements shall be maintained to at least the following PCI:

All runways > 70
Primary taxiways 〈 60
Aprons and secondary taxiways > 55

Recommendations

Steps 1 through 5 of the flow chart shown in Figure 3-1 were used in determining the recommendations suggested in Table 3-2. The M&R alternatives suggested for the existing surfaces were selected from those listed for various distresses in flexible pavements shown in Table 3-3 and rigid pavements shown in Table 3-4. In many instances, the performance of a specific alternative depends upon the geographical location and expertise of local contractors. Therefore, it is suggested that the local DIS personnel review all recommendations. Local costs for the approved alternatives can then be used with the Micro PAVER program to obtain a reasonable cost estimate. All overlay, repair, or major repair should be in accordance with UFC 3-269-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001b) that specifies that the following pavements be rigid pavement: all paved areas on which aircraft or helicopters are regularly parked, maintained, serviced, or preflight checked, on hangar floors and access aprons; on runway ends (305 m (1,000 ft) of a Class B runway; primary taxiways for Class B runways; hazardous cargo, power check, compass calibration, warmup, alert, arm/ disarm, holding, and washrack pads; and any other area where it can be documented that a flexible pavement will be damaged by jet blast or by spillage of fuel or hydraulic fluid.

The PCI was developed to determine maintenance and repair needs. If the PCI is low, maintenance or repair is needed to increase the PCI. If the PCI is low and the PCN is greater than the ACN, localized maintenance or repair will generally be an acceptable solution. Although these maintenance activities and repairs will improve the PCI to acceptable levels, they may not be the most cost-effective alternative. An overlay or other overall improvement may be more cost-effective than considerable localized maintenance or repairs. Certainly, if the current PCI is less than 25, overall improvements should be investigated.

When an overlay is recommended, the maintenance recommended is that which is needed to keep the pavement serviceable and safe and its PCI at the required minimum until the overlay is applied. The PCN is used to specify the structural capability of an airfield pavement. If the design aircraft's ACN is larger than the computed PCN, the pavement is structurally inadequate to support the mission traffic. If only repairs to improve the PCI are applied, the pavement could deteriorate quite rapidly. Structural improvements are required to increase the load-carrying capacity so that the PCN is greater than or equal to the ACN (aircraft load). Even if the PCI is high, structural improvements are necessary to support the mission traffic if the PCN is less than the design ACN.

The PCIs of four pavement features (T11B, A10B, A11B, and A18B) fail to meet the minimum acceptable level outlined above. To meet the minimum PCI requirements crack sealing is recommended for T11B, the surface of A10B should be removed and replaced, and the shattered slabs in features A11B and A18B should be replaced. The joint sealant in A11B should also be removed and replaced. The estimated cost to upgrade these four features is approximately $180,000 FY02 dollars. An airfield pavements cost estimating guide for various maintenance and repair alternatives is shown in Table 3-4.

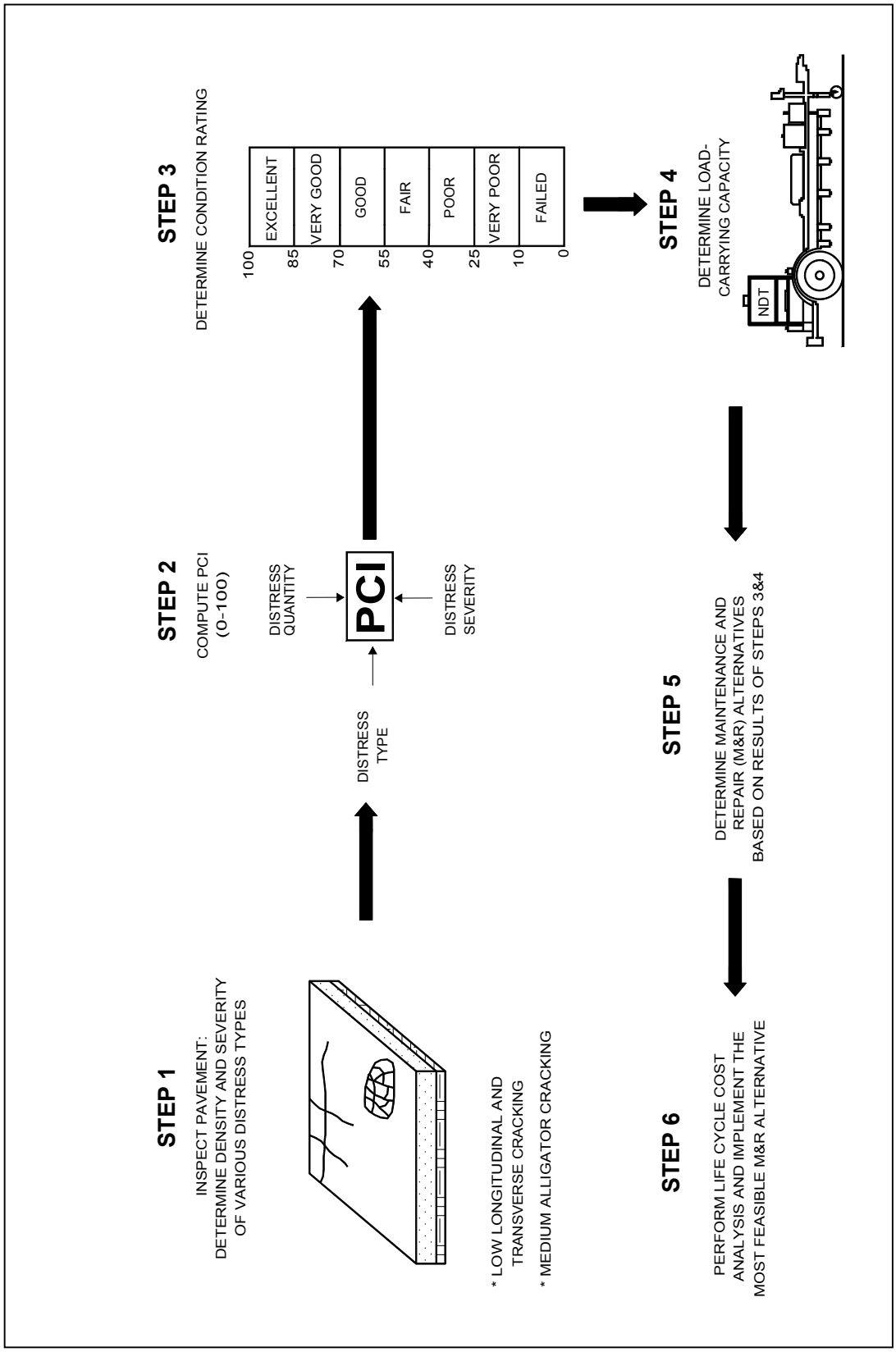


Figure 3-1. Flowchart for determination of maintenance and repair recommendations

Table 3-1
Airfield Pavement Evaluation General Summary

Pavement Feature	PCI	ACN/ PCN[2]	ISR Rating[3]	Work Classification[1]			
				Do Nothing	Maintenance	Repair	Major Repair
R1A	79	1.44	Amber			X	
R2C	73	0.77	Green		X		
R3A	71	1.32	Amber			X	
R4C	72	NA[4]	Green		X		
T1A	74	1.48	Amber			X	
T2C	90	1.00	Green		X		
T3B	92	1.17	Amber			X	
T4B	96	1.07	Amber			X	
T5A	77	2.45	Red			X	
T6A	84	2.55	Red			X	
T7A	91	1.75	Red			X	
T8B	93	1.48	Amber			X	
T9A	89	1.40	Amber			X	
T10A	79	1.32	Amber			X	
T11B	48	0.70	Red		X		
T12B	62	1.00	Amber		X		
T13B	86	1.23	Amber		X		
T14B	96	1.75	Red			X	
T15B	63	1.32	Amber			X	
A1B	63	2.23	Red			X	
A2B	94	1.53	Red			X	
A3B	97	1.88	Red			X	
A4B	91	1.04	Amber			X	
A5B	90	1.70	Red			X	
A6B	92	1.75	Red			X	

(Continued)

[1] Work is categorized for preliminary planning purposes only. Classification of work for administrative approval is an installation responsibility. Policy guidance for airfield pavements is provided in AR 420-72. In general, if the pavement real property facility is in a failed or failing condition, structural improvements to accommodate normal growth and evolution of missions and equipment are properly classified as repair work. Repair work includes recycling, overlays, slab replacement, and repairing drainage systems. The following types of work are properly classified as major repair: strengthening of a pavement to accommodate a new mission, extension or widening of the pavement, or complete replacement of the real property facility. Maintenance tasks for AC pavements include: crack sealing, partial and full depth patches, and surface seals. PCC pavement maintenance tasks include: crack and joint sealing and partial and full depth patches.
[2] Determined for design aircraft.
[3] Based on the PCI and ACN/PCN ratio of the pavement feature.
[4] Features were not evaluated for load because the outside edges do not receive aircraft traffic.

Table 3-1 (Concluded)

Pavement Feature	PCI	ACN/ PCN[2]	ISR Rating[3]	Work Classification[1]			
				Do Nothing	Maintenance	Repair	Major Repair
A7B	99	1.53	Red			X	
A8B	98	1.75	Red			X	
A9B	78	2.33	Red			X	
A10B	42	2.04	Red			X	
A11B	42	0.77	Red			X	
A12B	97	1.23	Amber			X	
A13B	88	0.83	Green		X		
A14B	97	1.53	Red			X	
A15B	93	1.63	Red			X	
A16B	92	1.63	Red			X	
A17B	91	1.53	Red			X	
A18B	51	1.00	Red			X	

[1] Work is categorized for preliminary planning purposes only. Classification of work for administrative approval is an installation responsibility. Policy guidance for airfield pavements is provided in AR 420-72. In general, if the pavement real property facility is in a failed or failing condition, structural improvements to accommodate normal growth and evolution of missions and equipment are properly classified as repair work. Repair work includes recycling, overlays, slab replacement, and repairing drainage systems. The following types of work are properly classified as major repair: strengthening of a pavement to accommodate a new mission, extension or widening of the pavement, or complete replacement of the real property facility. Maintenance tasks for AC pavements include: crack sealing, partial and full depth patches, and surface seals. PCC pavement maintenance tasks include: crack and joint sealing and partial and full depth patches.
[2] Determined for design aircraft.
[3] Based on the PCI and ACN/PCN ratio of the pavement feature.

Table 3-2
Summary of Overlay and Maintenance Requirements for the Day-to-Day Traffic Operations

Feature	Area Sq m (sq yd)	Overlay Requirements, mm (in.)[1] AC	PCC Partial Bond	PCC with no Bond	Maintenance and Repair Alternatives for Existing Surfaces
Runway 15-33					
R1A[2]	13 935 (16,667)	51 (2.0)	NA	See[4]	The PCI of this feature is above that required for runways. However, it is recommended that all medium-severity cracks be cleaned and then sealed with a high quality crack sealant.[5] Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
R2C	19 161 (22,917)	0 (0.0)	NA	See[4]	The PCI of this feature is above that required for runways. However, it is recommended that all medium-severity cracks be cleaned and then sealed with a high quality crack sealant.[5]
R3A[2]	13 935 (16,667)	51 (2.0)	NA	See[4]	The PCI of this feature is above that required for runways. However, it is recommended that all medium- and high-severity cracks be cleaned and then sealed with a high quality crack sealant.[5] Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
R4C	38 321 (45,833)	--[3]	--[3]	--[3]	Same as for R2C
Taxiway A					
T1A[2]	28 799 (34,444)	64 (2.5)	NA	See[4]	The PCI of this feature is above that required for taxiways. However, it is recommended that all medium- and high-severity cracks be cleaned and then sealed with a high quality crack sealant.[5] Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
Taxiway B					
T2C	2973 (3,556)	0 (0.0)	NA	See[4]	The PCI of this feature is above that required for taxiways. However, it is recommended that all medium- and high-severity cracks be cleaned and then sealed with a high quality crack sealant.[5]
T3B	10 382 (12,417)	51 (2.0)	NA	See[4]	The PCI of this feature is above that required for taxiways. Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
Taxiway C					
T4B	5806 (6,944)	51 (2.0)	NA	See[4]	Same as for T3B.
Taxiway E					
T5A[2]	18 580 (22,222)	140 (5.5)	NA	See[4]	The PCI of this feature is above that required for taxiways. However, it is recommended that all medium- and high-severity cracks be cleaned and then sealed with a high quality crack sealant[5] and that full-depth patches be applied to correct the alligator cracked areas. Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.

(Sheet 1 of 4)

[1] For planning purposes only.
[2] UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001b) requires that the surface be concrete.
[3] Edges were not evaluated for load-carrying capacity.
[4] Was not calculated because feature was evaluated as a flexible pavement.
[5] See TM 5-882-11/AFP 88-6, Chapter 7 (Headquarters, Departments of the Army and Air Force 1993) for guidance.

Table 3-2 (Continued)

Feature	Area Sq m (sq yd)	Overlay Requirements, mm (in.)[1]			Maintenance and Repair Alternatives for Existing Surfaces
		AC	PCC Partial Bond	PCC with no Bond	
Taxiway F					
T6A[2]	5481 (6,556)	127 (5.0)	NA	See[4]	The PCI of this feature is above that required for taxiways. However, it is recommended that all medium- and high-severity cracks be cleaned and then sealed with a high quality crack sealant.[5] Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
Taxiway G					
T7A[2]	6039 (7,222)	NA	165 (6.5)	203 (8.0)	The PCI of this feature is above that required for taxiways. However, it is recommended that within the next 2 years the joints be cleaned and sealed with a high-quality sealer.[5] Structural improvements are required.
T8B[2]	1882 (2,250)	NA	152 (6.0)	165 (6.5)	Same as for T7A.
Taxiway H					
T9A[2]	6503 (7,778)	64 (2.5)	NA	See[4]	The PCI of this feature is above that required for taxiways. However, it is recommended that all high-severity cracks be cleaned and then sealed with a high quality crack sealant.[5] Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
Taxiway I					
T10A[2]	44 592 (53,333)	51 (2.0)	NA	See[4]	Same as for T9A.
OLR Taxiway					
T11B	6271 (7,500)	0 (0.0)	NA	See[4]	Increase the PCI to an acceptable level by cleaning and then sealing all medium- and high-severity cracks with a high quality crack sealant.[5]
T12B	5574 (6,667)	0 (0.0)	NA	See[4]	The PCI of this feature is above that required for taxiways. However, it is recommended that all high-and medium-severity cracks be cleaned and then sealed with a high quality crack sealant.[5]
Southeast Taxiway					
T13B	2787 (3,333)	51 (2.0)	NA	See[4]	The PCI of this feature is above that required for taxiways. However, it is recommended that the medium- and high-severity cracks be cleaned and then sealed with a high-quality sealer.[5] Structural improvements are required to withstand the projected traffic.
T14B	7804 (9,333)	102 (4.0)	NA	See[4]	The PCI of this feature is above that required for taxiways. Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.

(Sheet 2 of 4)

[1] For planning purposes only.
[2] UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001b) requires that the surface be concrete.
[3] Edges were not evaluated for load-carrying capacity.
[4] Was not calculated because feature was evaluated as a flexible pavement.
[5] See TM 5-882-11/AFP 88-6, Chapter 7 (Headquarters, Departments of the Army and Air Force 1993) for guidance.

Table 3-2 (Continued)

Feature	Area Sq m (sq yd)	Overlay Requirements, mm (in.)[1] AC	PCC Partial Bond	PCC with no Bond	Maintenance and Repair Alternatives for Existing Surfaces
Compass Rose Taxiway					
T15B	1765 (2,111)	64 (2.5)	NA	See[4]	The PCI of this feature is above that required for taxiways. However, it is recommended that the medium- and high-severity cracks be cleaned and then sealed with a high-quality sealer.[5] Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
Hoverlane					
A1B	16 722 (20,000)	127 (5.0)	NA	See[4]	The PCI of this feature is above that required for hoverlanes. However, it is recommended that the medium- and high-severity cracks be cleaned and then sealed with a high-quality sealer.[5] Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
West Ramp					
A2B[2]	23 320 (27,891)	NA	152 (6.0)	178 (7.0)	The PCI of this feature is above that required for aprons. However, it is recommended that within the next 2 years the joints be cleaned and then sealed with a high-quality sealer.[5] Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
A3B[2]	51 629 (61,750)	NA	178 (7.0)	229 (9.0)	The PCI of this feature is above that required for aprons. However, it is recommended that within the next 2 years the joints be cleaned and then sealed with a high-quality sealer.[5] Structural improvements are required.
Hot Spot					
A4B[2]	7943 (9,500)	NA	152 (6.0)	152 (6.0)	Same as for A3B.
Hangar 3075 Access Apron					
A5B[2]	12 820 (15,333)	NA	152 (6.0)	191 (7.5)	Same as for A3B.
Parking Apron					
A6B[2]	39 134 (46,806)	NA	152 (6.0)	203 (8.0)	Same as for A3B.
A7B[2]	6010 (7,188)	NA	152 (6.0)	178 (7.0)	Structural improvements are required to withstand the projected traffic.
Hangars 3036 & 3041 Access Apron					
A8B[2]	9232 (11,042)	NA	152 (6.0)	203 (8.0)	Same as for A7B.
Hangar 3052 Access Apron					
A9B[2]	1891 (2,261)	127 (5.0)	NA	See[4]	Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.

(Sheet 3 of 4)

[1] For planning purposes only.
[2] UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001b) requires that the surface be concrete.
[3] Edges were not evaluated for load-carrying capacity.
[4] Was not calculated because feature was evaluated as a flexible pavement.
[5] See TM 5-882-11/AFP 88-6, Chapter 7 (Headquarters, Departments of the Army and Air Force 1993) for guidance.

Table 3-2 (Concluded)

Feature	Area Sq m (sq yd)	Overlay Requirements, mm (in.)[1] AC	PCC Partial Bond	PCC with no Bond	Maintenance and Repair Alternatives for Existing Surfaces
South Apron					
A10B	12 542 (15,000)	114 (4.5)	NA	See[4]	Increase the PCI to an acceptable level by removing and replacing the existing surface. Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
OLR Ramp					
A11B[2]	5797 (6,933)	NA	0 (0.0)	0 (0.0)	Increase the PCI to an acceptable level by replacing the shattered slabs and by replacing the joint sealant with a high-quality sealer[5] within the next 2 years.
Northeast Ramp					
A12B[2]	94 758 (113,333)	NA	152 (6.0)	152 (6.0)	The PCI of this feature is well above that required for aprons. Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
South Apron Pads					
A13B[2]	42 (50)	NA	0 (0.0)	0 (0.0)	The PCI of this feature is above that required for aprons. However due to the high-severity joint sealant damage, it is recommended that joint sealant be removed and replaced with a high-quality sealer.[5]
East Ramp					
A14B[2]	15 311 (18,312)	NA	142 (6.0)	191 (7.5)	The PCI of this feature is well above that required for aprons. Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
Southeast Ramp					
A15B[2]	14 040 (16,792)	NA	142 (6.0)	191 (7.5)	The PCI of this feature is above that required for aprons. However, it is recommended that joint sealant be removed and replaced with a high-quality sealer[5] within the next 2 years. Structural improvements are required. PCC reconstruction should be considered if this feature is to withstand the projected traffic.
Hangar 3025 Apron					
A16B[2]	17 349 (20,750)	NA	142 (6.0)	191 (7.5)	Same as for A15B.
Compass Rose					
A17B[2]	1394 (1,667)	NA	142 (6.0)	178 (7.0)	Same as for A15B.
OLR Parking Pads					
A18B[2]	230 (275)	NA	0 (0.0)	0 (0.0)	Increase the PCI to an acceptable level by replacing the shattered slabs.

(Sheet 4 of 4)

[1] For planning purposes only.
[2] UFC 3-260-02 (Headquarters, Departments of the Army, Navy, and the Air Force 2001b) requires that the surface be concrete.
[3] Edges were not evaluated for load-carrying capacity.
[4] Was not calculated because feature was evaluated as a flexible pavement.
[5] See TM 5-882-11/AFP 88-6, Chapter 7 (Headquarters, Departments of the Army and Air Force 1993) for guidance.

Table 3-3
Maintenance, Repair, and Major Repair Alternatives for Airfield Pavements, Flexible

	Maintenance				Repair												Major Repair		
Distress Type	Seal Minor Cracks	Repair Pot-Holes	Partial-Depth Patching	Apply Rejuve-nators[1]	Seal Major Cracks	Full-Depth Patching	Micro-Surfacing	Slurry Seal[2]	Thin AC Overlays[3]	Surface Milling	Grooving	Porous Friction Course	Repair Drainage Facilities[4]	Surface Recycling	AC Structural Overlay[3]	PCC Structural Overlay	Remove Existing Surface and Reconstruct	Hot Recycle	Cold Recycle
Alligator cracking	L	M,H	M			M,H	L	L					L,M,H		M,H	M,H	H		
Bleeding										A				A			A	A	A
Block cracking	L,M			L	M,H		L,M	L						M	M,H			M,H	M,H
Corrugation			L,M			L,M,H	L,M		M,H	L,M							M,H		
Depression			L,M,H			M,H	L		M,H				L,M,H				H		
Jet blast				A		A	A		A										
Reflection cracking	L,M				M,H		L,M	L							M,H			H	
Longitudinal and transverse cracking	L,M				M,H		L,M	L							M,H			H	
Oil spillage			A			A			A	A				A			A	A	
Patching	L,M		M		M	M,H									M,H		H	H	
Polished aggregate							A	A	A	A	A	A		A					
Raveling/weathering		M,H		L,M		M	L,M	L	M,H	M				M,H		H	H	M,H	
Rutting			L,M			L,M,H	L						L,M,H		M,H	H	H	M,H	
Shoving			L			L,M				L,M							M,H	M,H	
Slippage cracking	A		A		A	A									A		A	A	
Swell			L,M			M,H				L,M			L,M,H				H		

Note: L = low severity level; M = medium severity level; H = high severity level; A = no severity levels for this distress.

[1] Not to be used on high speed areas due to increased skid potential.

[2] Not to be used on heavy traffic areas.

[3] Patch distressed areas prior to overlay.

[4] Drainage facilities to be repaired as needed.

Table 3-4
Maintenance, Repair, and Major Repair Alternatives for Airfield Pavements, Rigid

	Maintenance				Repair											Major Repair	
Distress Type	Seal Minor Cracks	Joint Seal	Partial Patch	Epoxy Patch	Seal Major Cracks	Full-Depth Patch	Under Sealing	Slab Grind-ing	Surface Milling	AC Overlay	PCC Overlay	Slab Replace-ment	Crack & Seat with AC Struc-tural Overlay	AC Overlay w/ Geotextile	Repair/ Install Surface/ Subsurface Drainage System[1]	PCC Recycling	Remove Existing PCC and Reconstruct
Blowup			L,M			M,H						H					
Corner break	L			M,H	M,H	M,H						H					
Longitudinal/ Transverse/ Diagonal cracking	L,M				M,H					H	H	H	M,H	H	L,M,H	H	H
D cracking	L		M,H		M,H	H						H				H	H
Joint seal damage		M,H															
Patching (small) <5 ft[2]	L,M		M	L,M	M,H	M,H						H					
Patching/utility cut	L,M		M	L,M	M,H	M,H						H					H
Popouts[2]				A						A	A						
Pumping	A	A			A		A								A		
Scaling/map cracking			M,H					M,H		M,H	M,H						
Fault/settlement		L,M					M,H	L,M	M,H						L,M,H		
Shattered slab	L				L,M					M,H	M,H	M,H		H	L,M,H	H	H
Shrinkage crack[3]																	
Spalling (joints)		L	L,M	L,M,H	M,H	M,H											
Spalling (corner)			L,M	L,M	M,H	M,H											

Note: L = low severity level; M = medium severity level; H = high severity level; A = no severity levels for this distress.

[1] Drainage facilities to be repaired as needed.

[2] Popouts normally do not require maintenance.

[3] Shrinkage cracks normally do not require maintenance.

Table 3-5
Airfield Pavements M&R Cost Estimating Guide

Item	Description	U/M	Unit Cost ($)					
			FY00	FY01	FY02	FY03	FY04	FY05
1	Remove/replace 10 in. PCC w/14 in. PCC including 6 in. base	SY	71.32	73.10	74.92	76.80	78.71	80.68
2	PCC Construction	SY-IN	3.64	3.73	3.87	3.92	4.02	4.12
3	Remove/replace 6 in. Bituminous Pavement w/14 in. PCC including 6 in. base	SY	65.38	67.01	68.69	70.41	72.17	73.97
4	Asphalt Concrete Overlay							
	-- Airfield Mix	TONS	50.34	51.60	52.89	54.21	55.57	56.95
		SY-IN	2.14	2.20	2.27	2.33	2.40	2.48
	-- Highway Mix	TONS	46.36	47.52	48.71	49.92	51.17	52.45
		SY-IN	2.52	2.58	2.65	2.71	2.78	2.85
5	Joint Resealing (JFR)	LF	2.14	2.19	2.25	2.30	2.36	2.42
6	Joint Resealing (NON - JFR)	LF	1.90	1.95	2.00	2.05	2.10	2.15
7	Crack Routing/Sealing (PCC)	LF	2.63	2.70	2.76	2.83	2.90	2.97
8	Neoprene Compression Joint Seal							
	-- Saw Cutting Only	LF	1.33	1.36	1.40	1.43	1.47	1.50
	-- Lubrication, Furnish and Install Compression Seal							
	-- 1/2-in. wide joint	LF	3.30	3.38	3.47	3.55	3.64	3.73
	-- 5/8-in. wide joint	LF	3.66	3.75	3.85	3.94	4.04	4.14
	-- 3/4-in. wide joint	LF	4.49	4.60	4.72	4.84	4.96	5.09
9	Spall Repairs (Epoxy-Bonded PCC)	SF	25.30	25.93	26.58	27.25	27.93	28.63
10	PCC Pavement Removal (To Base Course) T < 12 in.	SY-IN	1.01	1.04	1.06	1.09	1.12	1.15
11	PCC Pavement Removal (To Base Course) T > 12 in.	SY-IN	1.39	1.46	1.50	1.53	1.57	1.61
12	Asphalt Pavement Removal (to base course)	SY-IN	0.92	0.94	0.97	0.99	1.01	1.04
13	Base/Subgrade Removal	SY-IN	0.61	0.63	0.64	0.66	0.66	0.69
14	Asphalt Milling/Profiling/Grinding (Cold)							
	-- up to 1-in. depth	SY	1.56	1.60	1.64	1.68	1.72	1.77
	-- up to 2-in. depth	SY	2.26	2.32	2.37	2.43	2.49	2.55
	-- up to 3-in. depth	SY	2.38	2.44	2.50	2.56	2.62	2.69
	-- up to 4-in. depth	SY	2.50	2.56	2.63	2.69	2.76	2.83
	-- small difficult jobs (hard agg. etc.)	SY-IN	2.97	3.04	3.12	3.20	3.28	3.36
15	PC Concrete Grinding/Profiling (Normally 1/2 in. is max Feasible)	SY-IN	19.02	19.50	19.98	20.48	20.99	21.52
16	Heater-Scarification (3/4—in.) – rejuvenation	SY	1.32	1.35	1.39	1.42	1.46	1.49
17	Cold Recycling 6 in. AC with 4-in.-thick AC O/L	SY	17.46	17.90	18.34	18.80	19.27	19.75
18	Slurry Seal	SY	1.57	1.61	1.65	1.69	1.73	1.78

(Continued)

Table 3-5 (Concluded)

Item	Description	U/M	Unit Cost ($)					
			FY00	FY01	FY02	FY03	FY04	FY05
19	Micro-Surfacing	SY	2.26	2.32	2.37	2.43	2.49	2.55
20	Single Bituminous Surface Treatment	SY	1.90	1.95	2.00	2.05	2.10	2.15
21	Double Bituminous Surface Treatment	SY	2.75	2.82	2.89	2.96	3.03	3.11
22	Rubberized Coal Tar Pitch Emulsion Sand Slurry Surface Treatment	SY	1.72	1.76	1.81	1.85	1.90	1.94
23	Rubberized Coal Tar Pitch Emulsion (No Aggregate)	SY	1.13	1.16	1.19	1.22	1.25	1.28
24	Fog Seal	SY	0.77	0.79	0.81	0.83	0.85	0.87
25	Rubberized Asphalt Systems							
	-- Stress Absorbing Membrane (SAM) Interlayer	SY	4.40	4.51	4.62	4.74	4.86	4.98
	-- SAM Seal Coat (uncoated chips)	SY	4.64	4.76	4.87	5.00	5.13	5.25
	-- SAM Seal Coat (precoated chips)	SY	4.99	5.11	5.24	5.37	5.50	5.64
26	Reinforcing Fabric Membranes (including tack coat)	SY	2.47	2.53	2.60	2.66	2.73	2.79
27	Elastomeric Inlay installed in Existing PCC, Complete (2 ft Wide X 100 ft Long X 2 in. Deep)	EA	25.0K	25.6K	26.3K	26.9K	27.6K	28.3K
28	PC Concrete Inlay (20 ft X 120 ft X 12 in. in Asphalt Pavement)	EA	17.8K	18.2K	18.7K	19.2K	19.7K	20.2K
29	Runway Grooving							
	-- Asphalt Concrete Pavement	SY	1.90	1.95	2.00	2.05	2.10	2.15
	-- Portland Concrete Pavement	SY	4.16	4.26	4.37	4.48	4.59	4.71
30	Runway Rubber Removal (High Pressure Water Blasting Method)	SF	0.059	0.060	0.062	0.063	0.065	0.066
31	Paint Removal							
	-- Partial Removal (Remove only loose, flaking, or poorly bonded paint)	SF	0.059	0.060	0.062	0.063	0.065	0.066
	-- Complete Removal (Using High Pressure water with sand injection)	SF	0.69	0.70	0.72	0.74	0.76	0.78
32	Airfield Marking							
	-- Reflectorized	SF	0.46	0.47	0.48	0.50	0.51	0.53
	-- Non-Reflectorized	SF	0.26	0.27	0.27	0.28	0.29	0.29
33	Street Marking							
	-- Reflectorized	SF	0.33	0.34	0.35	0.36	0.37	0.38
	-- Non-Reflectorized	SF	0.21	0.22	0.22	0.23	0.24	0.24
34	Random Slab Replacement							
	-- 12 ft by 12 ft by 12-in. thick	EA	1.2K	1.2K	1.3K	1.3K	1.3K	1.4K
	-- 25 ft by 25 ft by 12-in. thick	EA	4.8K	4.9K	5.0K	5.2K	5.3K	5.5K
	-- 25 ft by 25 ft by 18-in. thick	EA	7.1K	7.3K	7.5K	7.6K	7.8K	8.0K
	-- 25 ft by 25 ft slab	SY-IN	5.56	5.70	5.84	5.99	6.14	6.29
35	Soil Cement Stabilization (10 percent by weight)	SY-IN	0.50	0.51	0.53	0.54	0.55	0.57

4 Conclusions

The maintenance and rehabilitation alternatives discussed in Chapter 3 and summarized in Table 3-2 should be performed as soon as possible to retain the full benefit of the structural capacity of the existing pavements. The M & R alternatives suggested for the existing surfaces were selected from the alternatives listed for the various distresses shown in Tables 3-3. In many instances the performance of a specific alternative is dependent upon local conditions and contractors.

The operational ACN for the airfield rigid pavement facilities is 49/R/B/W/T and for the flexible pavement facilities 49/F/A/W/T/. PCNs for each facility are shown in Illustration 1. ISR ratings based on the ACN/PCN ratios and the PCIs of each respective facility are shown in Illustration 2.

Thaw-weakened conditions were not considered for this airfield. There are only a few days of freezing temperatures per year and the depth of penetration rarely exceeds the thickness of non-frost susceptible pavement structure. Also, there was no visible evidence of the effects of frost action.

References

American Society of Testing and Materials. (1994). "Standard test method for airport pavement condition index surveys," Designation: D 5340-93, West Conshohocken, PA.

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Appendix A
Background Data

Description of the Airfield

GAAF is located at Fort Lewis, Washington, in Pierce County and approximately 16 km (10 miles) southwest of Tacoma, WA. The airfield is located physiographically in the Puget Trough section of the Pacific Border province. The topography in the immediate vicinity consists of flat to gently rolling relief. The elevation of the airfield is 92 m (302 ft) above mean sea level. The soils in the area consist of sand and gravel deposits with varying amounts of organic material. The principal soil types of the airfield site are classified as gravelly clayey sands (SW-SC) according to the Unified Soil Classification System.

A layout of the airfield is shown in Figure A1. Pavement feature identifications and locations are shown in Figure A2. In October 2001 the airfield consisted of one active runway (15-33), a parallel taxiway (Taxiway A), various parking aprons, connecting taxiways, and a compass rose. Runway 15-33 was 1867 m (6,125 ft) long and 46 m (150 ft) wide.)

The climatological data used herein were obtained from the weather station at Fort Lewis, WA. The annual rainfall in the area is about 1021 mm (40.4 in.) and the annual snowfall is 224 mm (8.8 in.). The maximum and minimum temperatures were 39°C and –18°C (102°F and 0°F), respectively. Temperature and precipitation data are summarized in Table A1.

Previous Reports

Pertinent data for use in this evaluation were extracted from the previous reports listed below:

a. U.S. Army Engineer Waterways Experiment Station, "Airfield Pavement Evaluation, Gray Army Airfield, Fort Lewis, Washington," Miscellaneous Paper GL-94-44, September 1994, Vicksburg, MS.

b. U.S. Army Engineer Waterways Experiment Station, "Condition Survey, Gray Army Airfield, Fort Lewis, Washington," Miscellaneous Paper GL 89-11, June 1989, Vicksburg, MS.

c. U.S. Army Engineer Waterways Experiment Station, "Airfield Pavement Evaluation, Gray Army Airfield, Fort Lewis, Washington," Miscellaneous Paper GL-85-24, September 1985, Vicksburg, MS.

d. U.S. Army Engineer Waterways Experiment Station, "Condition Survey, Gray Army Airfield, Fort Lewis, Washington," Miscellaneous Paper S-73-2, February 1973, Vicksburg, MS.

e. U.S. Army Engineer Waterways Experiment Station, "Airfield Pavement Evaluation, Gray Army Airfield, Fort Lewis, Washington," Technical Report No. 3-466, January 1959, Vicksburg, MS.

f. U.S. Army, Seattle Engineer District, "Report on Pavement Evaluation Gray Field, Fort Lewis, Washington," May 1944, Seattle, WA.

Design and Construction History

The original pavements at GAAF were constructed in three stages. Grading of the E-W runway (Taxiway I) and the N-S runway (R/W 15-33) began in December 1941 and completed in May 1942. Base course and surface construction of these facilities occurred during the November 1942 to March 1943 time period. Associated taxiways and aprons were constructed between July and October 1943. Upgrading of the pavements, including new construction or strengthening of existing facilities, was performed during the 1964-1968 and 1984-1988 period. A joint and crack-sealing project was completed in the summer of 2001 to seal cracks caused in February 2001 by an earthquake. Table A2 presents the history of the major construction activities at GAAF. A summary of the physical property data of the various pavement features is shown in Table A3.

Traffic History

The airfield operations manager provided traffic records for GAAF at the time of this evaluation for the 1-year period October 2000 through September 2001. These records indicate that the airfield is utilized by both fixed-wing and rotary-wing aircraft. The airfield was divided into two primary traffic regions, fixed-wing and rotary-wing for evaluation purposes. Frequencies of operation for the various aircraft are well defined by accurate records presented in Table A4. As shown in Table A4, the primary fixed-wing aircrafts are the C-17, C-141, and C-130. The rotary-wing aircraft using the airfield include the UH-60, CH-47, and OH-58.

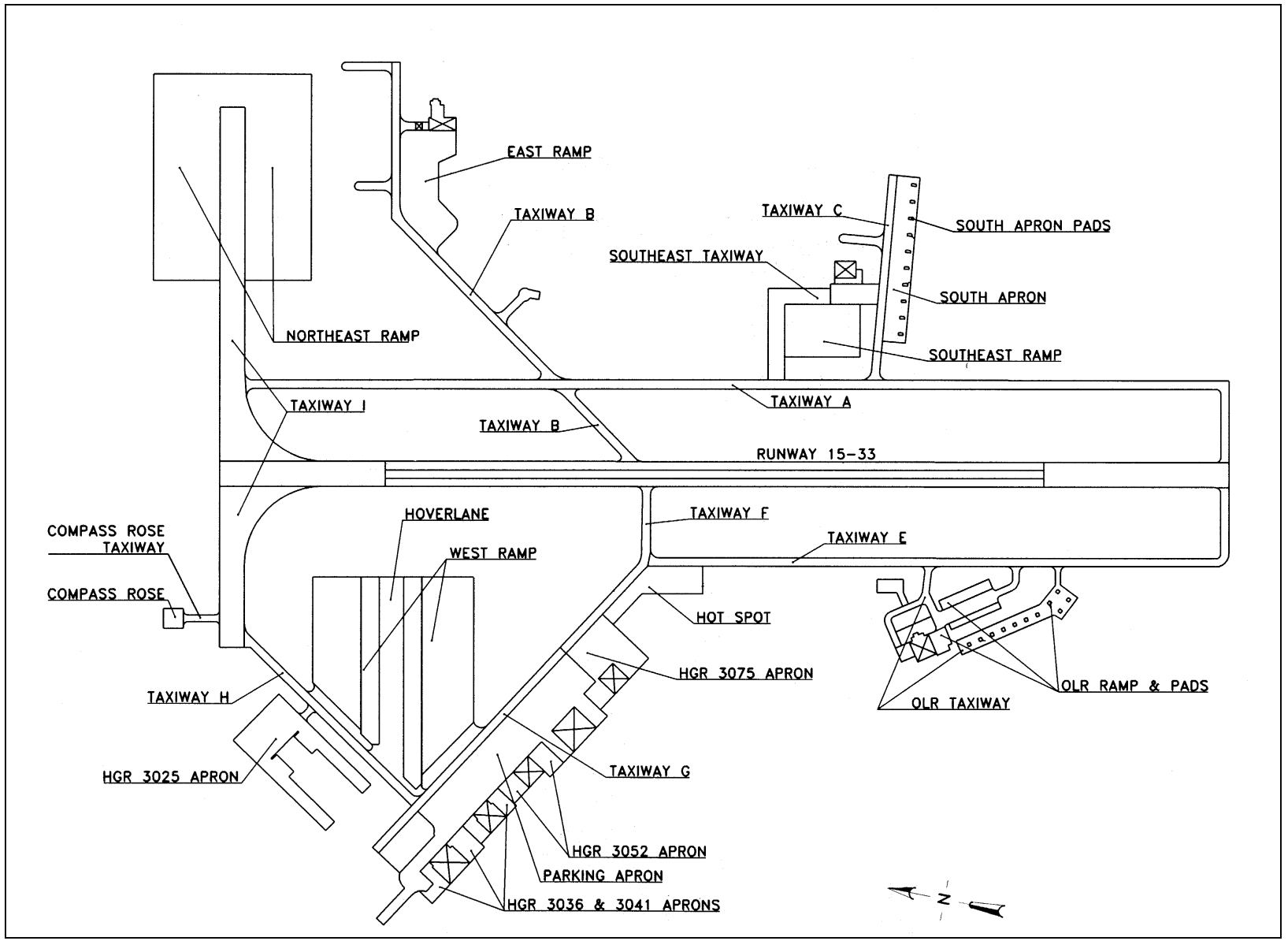

Figure A1. Layout of airfield and facility identifications

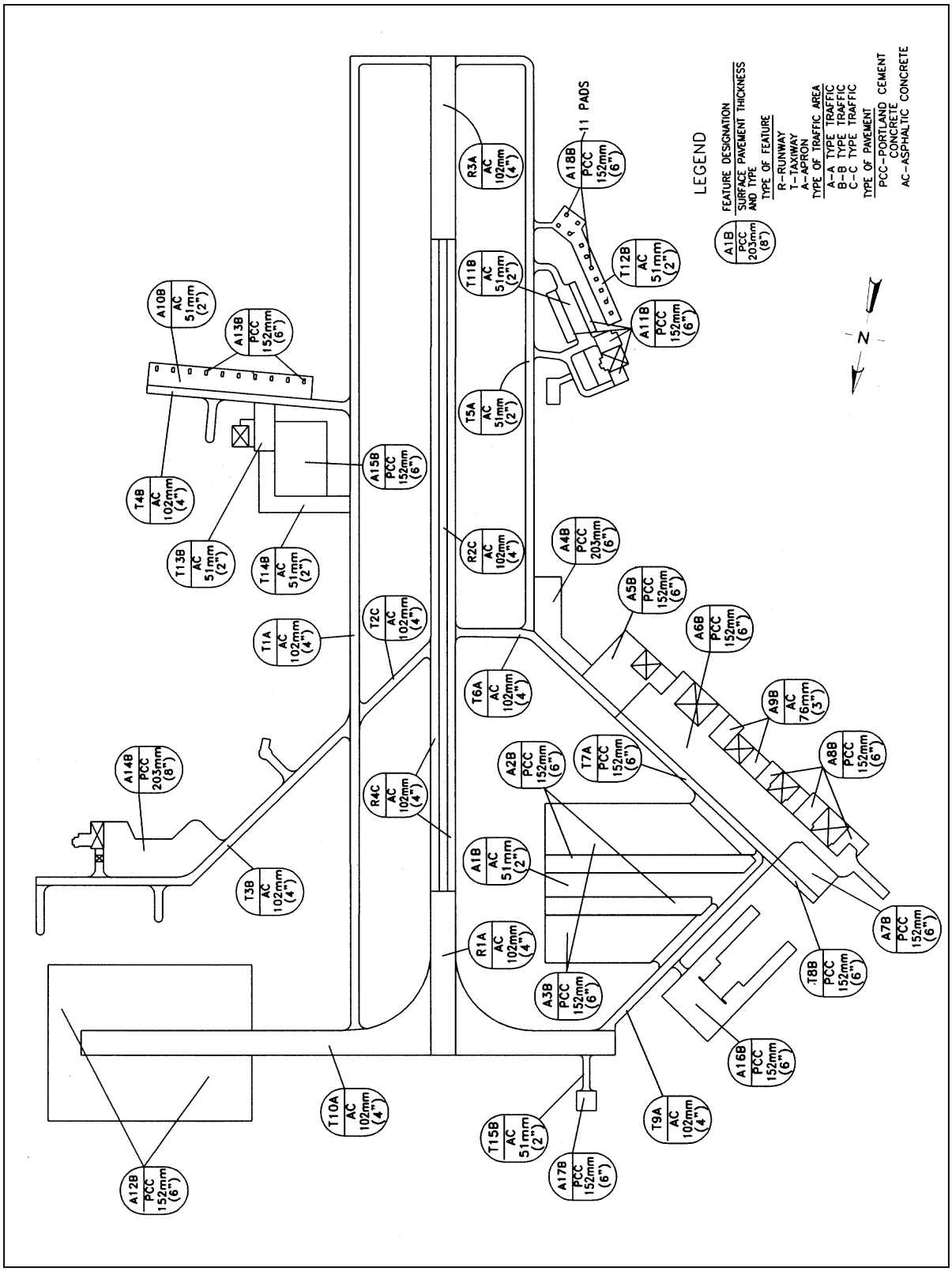

Figure A2. Pavement feature identification and location

Table A1
Climatological Data Summary

	J	F	M	A	M	J	J	A	S	O	N	D	ANN	YRS REC
Temperature, °C (°F)														
Highest	17 (62)	22 (71)	24 (75)	29 (85)	36 (97)	34 (94)	38 (100)	39 (102)	37 (99)	32 (90)	22 (71)	19 (67)	39 (102)	24
Mean Daily Max	8 (46)	10 (50)	12 (54)	15 (59)	18 (65)	21 (70)	24 (76)	25 (77)	22 (72)	17 (62)	11 (51)	8 (46)	16 (61)	24
Mean	4 (39)	5 (41)	7 (45)	9 (49)	12 (54)	15 (59)	18 (64)	18 (64)	15 (59)	11 (51)	7 (44)	4 (39)	11 (51)	24
Mean Daily Min	1 (34)	2 (35)	3 (37)	4 (40)	7 (45)	10 (50)	12 (53)	12 (53)	10 (50)	7 (44)	4 (39)	2 (35)	6 (43)	24
Lowest	-15 (5)	-14 (6)	-11 (12)	-4 (25)	-3 (27)	0 (32)	4 (39)	4 (39)	-1 (31)	-6 (21)	-15 (5)	-18 (0)	-18 (0)	24
Precipitation, mm (in.)														
Mean	147 (5.8)	114 (4.5)	102 (4.0)	81 (3.2)	51 (2.0)	46 (1.8)	20 (0.8)	30 (1.2)	46 (1.8)	86 (3.4)	152 (6.0)	150 (5.9)	1021 (40.4)	24
Snowfall, mm (in.)														
Mean	86 (3.4)	36 (1.4)	25 (1.0)	#	#	#	0	0	#	#	23 (0.9)	53 (2.1)	224 (8.8)	24
Relative Humidity, %														
Mean 0600 LST 1600 LST	87 74	88 68	87 60	87 56	86 53	86 52	86 49	86 49	88 52	89 63	88 74	87 77	87 61	24

Source of data: www.afccc.af.mil/climo Fort Lewis, Washington
# Denotes less than 1 mm (0.05 in.).

Table A2
Construction History

Pavement Facility (Feature)	Surface Pavement Thickness, mm (in.)	Surface Pavement Type	Construction Date
Runway 15-33			
R1A, R2C, R3A, and R4C	203 (8.0)[1]	AC	1943
R1A, R2C, R3A, and R4C	51 (2.0)[2]	AC	1968
Taxiway A			
T1A	203 (8.0)[1]	AC	1943
	51 (2.0)[2]	AC	1984
Taxiway B			
T2C and T3B	203 (8.0)[1]	AC	1943
	51 (2.0)[2]	AC	1984
Taxiway C			
T4B	203 (8.0)[1]	AC	1943
	51 (2.0)[2]	AC	1984
Taxiway E			
T5A	203 (8.0)[1]	AC	1943
	51 (2.0)[2]	AC	1984
Taxiway F			
T6A	203 (8.0)[1]	AC	1943
	51 (2.0)[2]	AC	1984
Taxiway G			
T7A	152 (6.0)[3]	PCC	1943
T8B	152 (6.0)	PCC	1963
Taxiway H			
T9A	203 (8.0)[1]	AC	1943
	51 (2.0)[2]	AC	1984
Taxiway I			
T10A	203 (8.0)[1]	AC	1943
T10A	51 (2.0)[2]	AC	1968
OLR Taxiway			
T11B	203 (8.0)[1]	AC	1964
National Guard Taxiway			
T12B	203 (8.0)[1]	AC	1987
Southeast Taxiway			
T13B	203 (8.0)[1]	AC	1984
T14B	152 (6.0)[1]	AC	1986
Compass Rose Taxiway			
T15B	152 (6.0)[1]	AC	1986
Hoverlane			
A1B	203 (8.0)[1]	AC	1963
West Ramp			
A2B	152 (6.0)[3]	PCC	1963
A3B	152 (6.0)[4]	PCC	1984
Hot Spot			
A4B	203 (8.0)	PCC	1963
Hangar 3075 Access Apron			
A5B	152 (6.0)	PCC	1963
Parking Apron			
A6B	152 (6.0)[3]	PCC	1943
A7B	152 (6.0)	PCC	1963
Hangars 3036 & 3041 Access Apron			
A8B	152 (6.0)	PCC	1964
Hangar 3052 Access Apron			
A9B	229 (9.0)[1]	AC	1963
South Apron			
A10B	191 (7.5)[1]	AC	1984
OLR Ramp			
A11B	152 (6.0)	PCC	1964

(Continued)

[1] Thickness includes AC, base, and subbase.
[2] Overlay pavement.
[3] Edges thickened to 229 mm (9.0 in).
[4] Edges thickened to 191 mm (7.5 in).

Table A2 (Concluded)

Pavement Facility (Feature)	Surface Pavement Thickness, mm (in.)	Surface Pavement Type	Construction Date
Northeast Ramp A12B	152 (6.0)	PCC	1985
South Apron A13B	203 (8.0)	PCC	1984
East Ramp A14B	152 (6.0)	PCC	1988
Southeast Ramp A15B	152 (6.0)	PCC	1986
Hangar 3025 Apron A16B	152 (6.0)	PCC	1988
Compass Rose A17B	152 (6.0)	PCC	1986
OLR Parking Pads A18B	152 (6.0)	PCC	1986

[1] Thickness includes AC, base, and subbase.
[2] Overlay pavement.[3] Edges thickened to 8 in.

Table A3
Summary of Physical Property Data

Facility					Overlay Pavement			Pavement			Base			Subbase			Subgrade	
Feature	Identification	Length m (ft)	Width m (ft)	General Condition PCI	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] Mm (in.)	Description	Modulus[2] MPa (psi)	Thickness[1] mm (in.)	Description	Modulus[2] MPa (psi)	Description	Modulus[2] MPa (psi)
Fixed-Wing Facilities																		
R1A	Runway 15-33	305 (1,000)	46 (150)	Very good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	346 (50,387)				Gravelly clayey sand (SW-SC)	169 (24,489)
R2C	Runway 15-33	1257 (4,125)	15 (50)	Very good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	279 (40,469)				Gravelly clayey sand (SW-SC)	245 (35,519)
R3A	Runway 15-33	305 (1,000)	46 (150)	Very good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	361 (52,464)				Gravelly clayey sand (SW-SC)	186 (26,963)
R4C	Runway 15-33 (Runway Edges)	1257 (4,125)	30 (100)	Very good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	--[3]				Gravelly clayey sand (SW-SC)	--[3]
T1A	Taxiway A	1890 (6,200)	15 (50)	Very good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	359 (52,074)				Gravelly clayey sand (SW-SC)	184 (26,649)
T2C	Taxiway B	195 (640)	15 (50)	Excellent	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	377 (54,726)				Gravelly clayey sand (SW-SC)	199 (28,830)
T3B	Taxiway B	681 (2,235)	15 (50)	Excellent	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	418 (60,620)				Gravelly clayey sand (SW-SC)	235 (34,056)
T4B	Taxiway C	381 (1,250)	15 (50)	Excellent	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	440 (63,811)				Gravelly clayey sand (SW-SC)	256 (37,126)
T5A	Taxiway E	1219 (4,000)	15 (50)	Very good				51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	324 (47,000)				Gravelly clayey sand (SW-SC)	157 (22,743)
T6A	Taxiway F	360 (1,180)	15 (50)	Very good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	268 (38,860)				Gravelly clayey sand (SW-SC)	118 (17,139)

(Sheet 1 of 4)

[1] Values from original construction data and/or measurements recorded in previous investigations.
[2] Modulus values used for the structural analysis of the pavement features.
[3] Structural analysis was not performed on runway edges.

Table A3 (Continued)

Facility					Overlay Pavement			Pavement			Base			Subbase			Subgrade	
Feature	Identification	Length m (ft)	Width m (ft)	General Condition PCI	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] Mm (in.)	Description	Modulus[2] MPa (psi)	Thickness[1] mm (in.)	Description	Modulus[2] MPa (psi)	Description	Modulus[2] MPa (psi)
Fixed-Wing Facilities (Continued)																		
T7A	Taxiway G	396 (1,300)	15 (50)	Excellent				152 (6.0)	PCC	5.5 (800)	51 (2.0)	Sandy gravel (GW)	182 (26,473)[4]				Gravelly clayey sand (SW-SC)	182 (26,473)[4]
T8B	Taxiway G	123 (405)	15 (50)	Excellent				152 (6.0)	PCC	5.5 (800)							Gravelly clayey sand (SW-SC)	266 (38,549)
T9A	Taxiway H	427 (1,400)	15 (50)	Excellent	51 (2.0)	AC		51(2.0)	AC		152 (6.0)	Sandy gravel (GW)	370 (53,753)				Gravelly clayey sand (SW-SC)	193 (28,018)
T10A	Taxiway I	975 (3,200)	46 (150)	Very good	51 (2.0)	AC		51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	383 (55,550)				Gravelly clayey sand (SW-SC)	198 (29,528)
T13B	Southeast Taxiway	91 (300)	30 (100)	Excellent				51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	436 (63,346)				Gravelly clayey sand (SW-SC)	253 (36,668)
T14B	Southeast Taxiway	256 (840)	30 (100)	Excellent				51 (2.0)	AC		102 (4.0)	Stabilized base	411 (59,716)				Gravelly clayey sand (SW-SC)	203 (29,447)
T15B	Compass Rose Taxiway	61 (200)	29 (95)	Good				51 (2.0)	AC		102 (4.0)	Stabilized base	362 (52,606)				Gravelly clayey sand (SW-SC)	277 (40,147)
A1B	Hoverlane	366 (1,200)	46 (150)	Good				51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	342 (49,628)				Gravelly clayey sand (SW-SC)	170 (24,724)
A2B	West Ramp	393 (1,288)	67 (220)	Excellent				152 (6.0)	PCC	5.5 (800)							Gravelly Clayey Sand (SW-SC)	250 (36,321)

(Sheet 2 of 4)

[1] Values from original construction data and/or measurements recorded in previous investigations.
[2] Modulus values used for the structural analysis of the pavement features.
[3] Structural analysis was not performed on runway edges.
[4] Base and subgrade were combined for backcalculating the modulus value.

Table A3 (Continued)

Facility					Overlay Pavement			Pavement			Base			Subbase			Subgrade	
Feature	Identification	Length m (ft)	Width m (ft)	General Condition PCI	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] Mm (in.)	Description	Modulus[2] MPa (psi)	Thickness[1] mm (in.)	Description	Modulus[2] MPa (psi)	Description	Modulus[2] MPa (psi)
Fixed-Wing Facilities (Continued)																		
A3B	West Ramp	357 (1,170)	192 (630)	Excellent				152 (6.0)	PCC	5.5 (800)	102 (4.0)	Stabilized base	174 (25,291)[4]				Gravelly Clayey Sand (SW-SC)	174 (25,291)[4]
A4B	Hot Spot	640 (2,100)	23 (75)	Excellent				203 (8.0)	PCC	5.5 (800)							Gravelly Clayey Sand (SW-SC)	332 (48,226)
A5B	Hangar 3075 Access Apron	122 (400)	105 (345)	Excellent				152 (6.0)	PCC	5.5 (800)							Gravelly Clayey Sand (SW-SC)	188 (27,339)
A6B	Parking Apron	594 (1,950)	76 (250)	Excellent				152 (6.0)	PCC	5.5 (800)	51 (2.0)	Sandy-Gravel (GP)	176 (25,489)[4]				Gravelly Clayey Sand (SW-SC)	176 (25,489)[4]
A7B	Parking Apron	123 (405)	49 (162)	Excellent				152 (6.0)	PCC	5.5 (800)							Gravelly Clayey Sand (SW-SC)	243 (35,281)
A8B	Hangars 3036 & 3041 Access Apron	160 (525)	65 (213)	Excellent				152 (6.0)	PCC	5.5 (800)							Gravelly Clayey Sand (SW-SC)	171 (24,731)
A9B	Hangar 3052 Access Apron	56 (185)	34 (110)	Very good				76 (3.0)	AC		152 (6.0)	Sandy gravel (GW)	307 (44,535)				Gravelly clayey sand (SW-SC)	144 (20,964)
A10B	South Apron	305 (1,000)	43 (140)	Fair				38 (1.5)	AC		152 (6.0)	Sandy gravel (GW)	187 (27,140)				Gravelly clayey sand (SW-SC)	215 (31,144)
A12B	Northeast Ramp	377 (1,238)	290 (950)	Excellent				152 (6.0)	PCC	5.5 (800)	102 (4.0)	Stabilized base	1551 (225,000)				Gravelly Clayey Sand (SW-SC)	350 (50,770)

(Sheet 3 of 4)

[1] Values from original construction data and/or measurements recorded in previous investigations.
[2] Modulus values used for the structural analysis of the pavement features.
[4] Base and subgrade were combined for backcalculating the modulus value.

Table A3 (Concluded)

Facility					Overlay Pavement			Pavement			Base			Subbase			Subgrade	
Feature	Identification	Length m (ft)	Width m (ft)	General Condition PCI	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] mm (in.)	Description	Flex. Str.[1] MPa (psi)	Thickness[1] Mm (in.)	Description	Modulus[2] MPa (psi)	Thickness[1] mm (in.)	Description	Modulus[2] MPa (psi)	Description	Modulus[2] MPa (psi)
Fixed-Wing Facilities (Continued)																		
A14B	East Ramp	229 (750)	103 (337)	Excellent				152 (6.0)	PCC	5.5 (800)	102 (4.0)	Stabilized base	1551 (225,000)				Gravelly Clayey Sand (SW-SC)	189 (27,384)
A15B	Southeast Ramp	142 (465)	99 (325)	Excellent				152 (6.0)	PCC	5.5 (800)	102 (4.0)	Stabilized base	234 (33,931)[4]				Gravelly Clayey Sand (SW-SC)	234 (33,931)[4]
A16B	Hangar 3025 Apron	238 (780)	119 (390)	Excellent				152 (6.0)	PCC	5.5 (800)	102 (4.0)	Stabilized base	247 (35,826)[4]				Lean Clay (CL)	247 (35,826)[4]
A17B	Compass Rose	38 (125)	37 (120)	Excellent				152 (6.0)	PCC	5.5 (800)	102 (4.0)	Stabilized base	239 (34,758)[4]				Gravelly Clayey Sand (SW-SC)	239 (34,758)[4]
Rotary-Wing Facilities																		
T11B	OLR Taxiway	411 (1,350)	15 (50)	Fair				51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	116 (16,876)				Gravelly clayey sand (SW-SC)	218 (31,621)
T12B	OLR Taxiway	229 (750)	24 (80)	Good				51 (2.0)	AC		152 (6.0)	Sandy gravel (GW)	140 (20,256)				Gravelly clayey sand (SW-SC)	178 (25,795)
A11B	OLR Ramp	140 (460)	43 (140)	Fair				152 (6.0)	PCC	5.5 (800)							Gravelly Clayey Sand (SW-SC)	196 (28,383)
A13B	South Apron Pads	9 (30)	46 (150)	Excellent				203 (8.0)	PCC	5.5 (800)							Gravelly Clayey Sand (SW-SC)	168 (24,428)
A18B	OLR Parking Pads	50 (165)	5 (15)	Fair				152 (6.0)	PCC	5.5 (800)							Gravelly Clayey Sand (SW-SC)	172 (25,025)

(Sheet 4 of 4)

[1] Values from original construction data and/or measurements recorded in previous investigations.
[2] Modulus values used for the structural analysis of the pavement features.
[4] Base and subgrade were combined for backcalculating the modulus value.

Table A4
Traffic Data (October 2000 thru September 2001)

Aircraft	Weight kg (lb)	12-month Period	20-Year Departures
C-17	263 080 (580,000)	47	940
C-130	70 310 (155,000)	100	2000
C-141	146 510 (323,000)	10	200
C-12J	7530 (16,600)	1,000	20,000
C-20	31 620 (69,700)	15	300
C-23	11 160 (24,600)	400	8,000
C-9	48 990 (108,000)	9	180
P-3C	61 240 (135,000)	2	40
FA-18F	29 940 (66,000)	3	60
B-737-400	68 040 (150,000)	1	20
CH-47	22 680 (50,000)	2,400	48,000
UH-60	7390 (16,300)	540	10,800
OH-58	2280 (5,000)	300	6,000

Appendix B
Tests and Results

Tests Conducted

The pavements were evaluated based on the results from nondestructive testing utilizing a heavy weight deflectometer (HWD). The test procedures and results are discussed below.

Nondestructive Tests

Test equipment

Nondestructive tests (NDT) were performed on the pavements with the Dynatest model 8081 (HWD). The HWD is an impact load device that applies a single-impulse transient load of approximately 25- to 30-millisecond duration. With this trailer-mounted device, a dynamic force is applied to the pavement surface by dropping a weight onto a set of rubber cushions which results in an impulse loading on an underlying circular plate 300 mm (11.8 in.) in diameter in contact with the pavement. The applied force and the pavement deflections, respectively, are measured with load cells and velocity transducers. The drop height of the weights can be varied from 0 to 399 mm (15.7 in.) to produce a force from 0 to approximately 222 kN (50,000 lb). The system is controlled with a laptop computer that also records the output data. Velocities were measured and deflections computed at the center of the load plate (D1) and at distances of 305 (12), 610 (24), 914 (36), 1219 (48), 1524 (60), and 1828 mm (72 in.) (D2 - D7) from the center of the load plate.

Test procedure

On runways and taxiways, deflection basin measurements were made at 30-m (100-ft) intervals on alternate sides of the centerline along the main gear wheel paths. The tests were performed on 3- to 4-m (10- to 12-ft) offsets alternating left and right of the centerline. The parking aprons were tested in a grid pattern of approximately 30-m (100-ft) intervals or at locations that were

selected to ensure that adequate NDT were performed per feature for evaluation purposes. Lines along which the NDT were conducted are indicated in Figure B1. At each test location, pavement deflection measurements were recorded at force levels of approximately 67, 122, 157, or 222 kN (15,000, 25,000, 35,000, or 50,000 lb). Impulse stiffness modulus (ISM) values were then calculated based on the slope of the plot of impulse load versus deflection at the first sensor (D1), for the maximum force level.

NDT Analysis

The NDT results or ISM data for each facility were grouped according to different pavement features. Figures B2 through B32 graphically show the ISM test results. A representative basin for each feature was determined using the computerized Layered Elastic Evaluation Program (LEEP). Table B1 shows the representative basins for each feature as determined from the NDT.

Representative basins were used to determine section modulus values of the various layers within the pavement structure in each feature. Deflection basins were input to a multi-layered, linear elastic backcalculation program to determine the surface, base, and subgrade modulus values. The program determines a set of modulus values that provide the best fit between a measured (NDT) deflection basin and a computed (theoretical) deflection basin. Table B2 presents a summary of the backcalculated modulus values based on the representative basins for each pavement section.

Modulus values for AC surface layers can be determined using three methods: (a) use the surface temperature at the time of testing and the previous 5-day mean air temperature, (b) backcalculate the modulus values using the HWD deflection basins, or (c) determine the design modulus from past temperature data. All three methods of determining the AC modulus values are described in UFC 3-260-03 (Headquarters, Departments of the Army, the Air Force, and the Navy April 2001). All pavements have been evaluated for a design life of 20 years. The modulus of an AC layer is temperature dependent; therefore, seasonal variation is considered by using a design modulus based on historical temperature data. From the climatological table (Table A1), an average daily maximum temperature of 25ºC (77ºF) and an average daily mean of 18ºC (64ºF) for August (hottest month) were used in determining the design AC modulus. For a loading frequency of 2 Hz for taxiways and aprons, the design AC modulus is 1748 MPa (253,692 psi) for a loading frequency of 10 Hz for the runway, the design AC modulus is 2814 MPa (408,382 psi). The design AC modulus along with the backcalculated values for the base and subgrade layers were used to determine the structural capacity of the AC pavement features.

Modulus values for PCC pavements can be backcalculated using the HWD deflection basins or a design modulus for the PCC can be used. In the evaluation of a rigid pavement, the design modulus should be used for the PCC layer along with the backcalculated values for the subgrade layers. The backcalculated PCC modulus values shown in Table B2 are greater than the default range of 17 237 to

48 263 MPa (2,500,000 to 7,000,000 psi) recommended in UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force, and the Navy 2001). This manual also recommends a modulus of 34 474 MPa (5,000,000 psi) for a PCC layer in good condition.

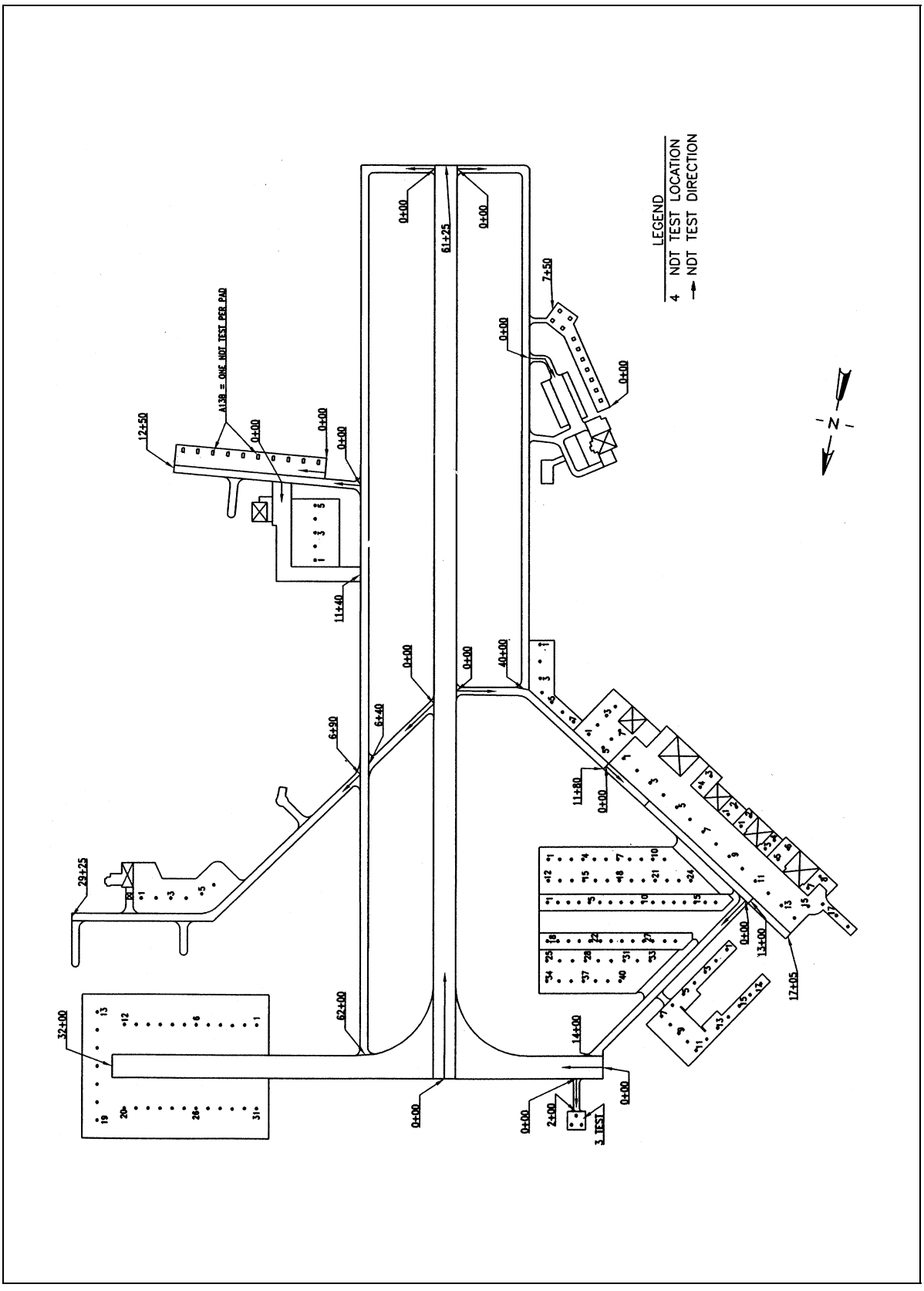

Figure B1. NDT test locations/direction

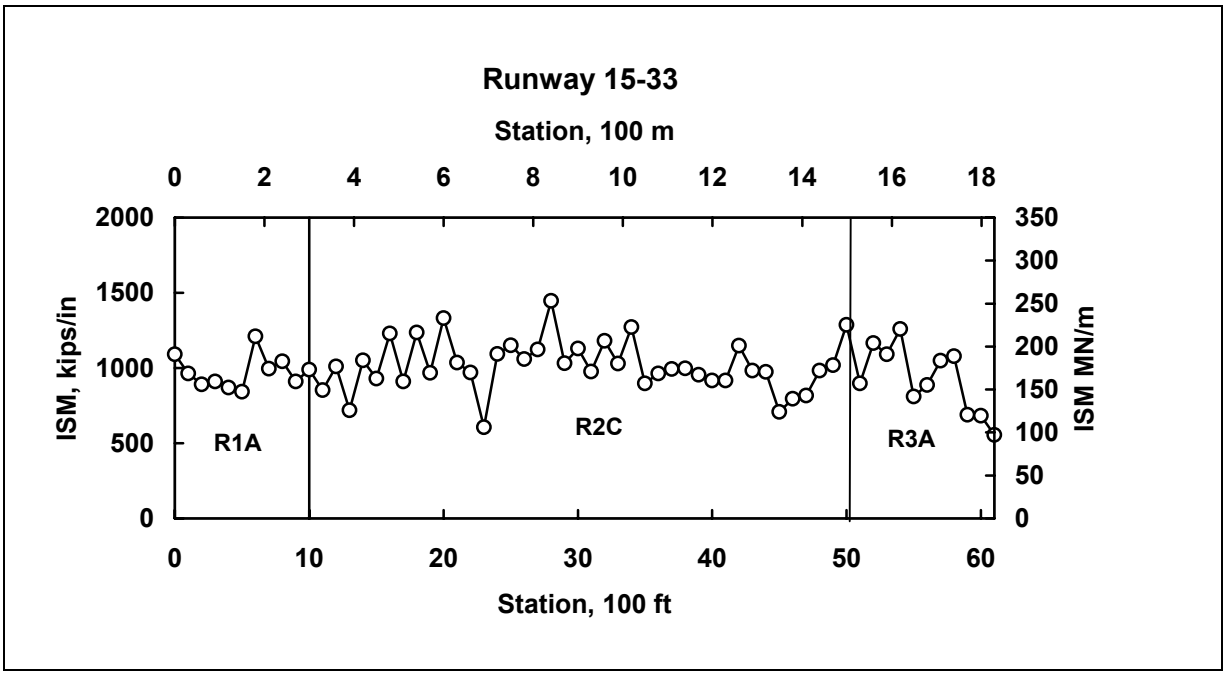

Figure B2. ISM profile, Runway 15-33, Features R1A thru R3A

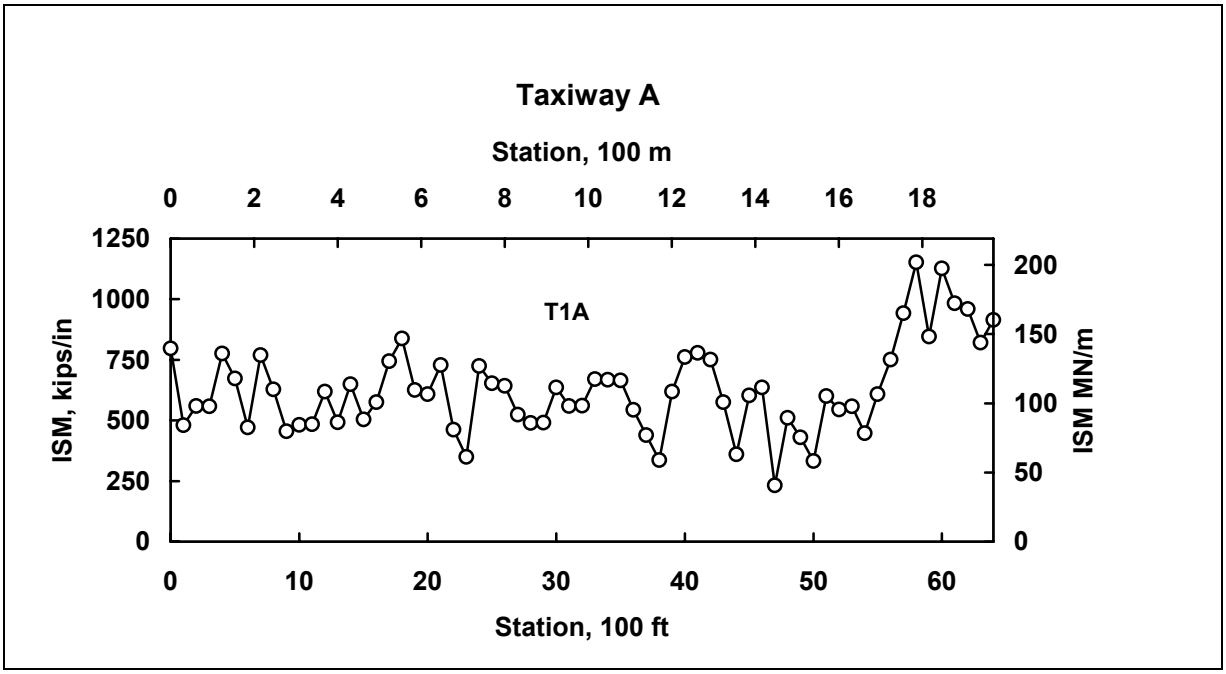

Figure B3. ISM profile, Taxiway A, Feature T1A

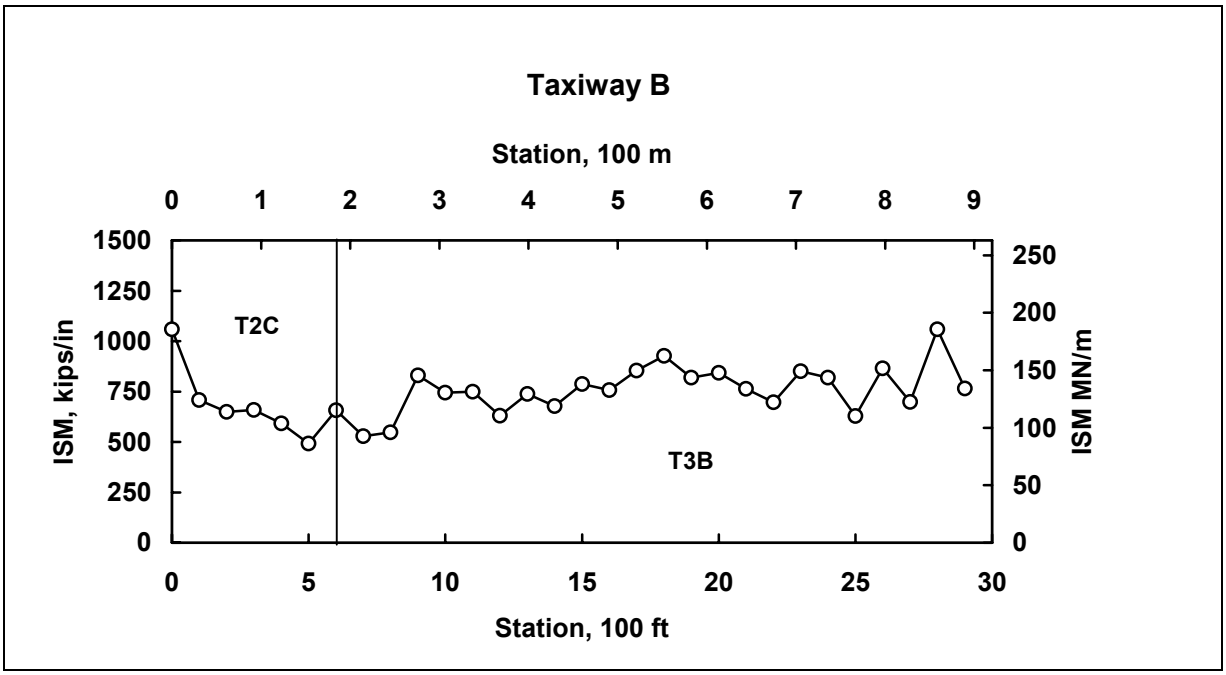

Figure B4. ISM profile, Taxiway B, Features T2C and T3B

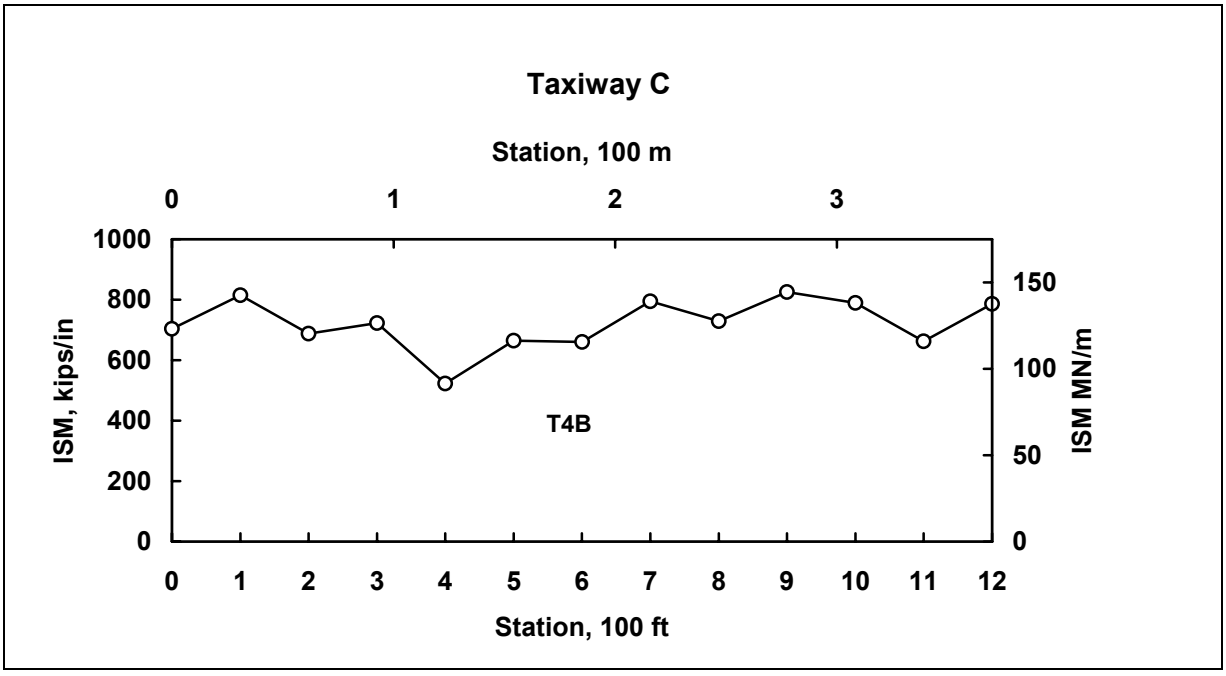

Figure B5. ISM profile, Taxiway C, Feature T4B

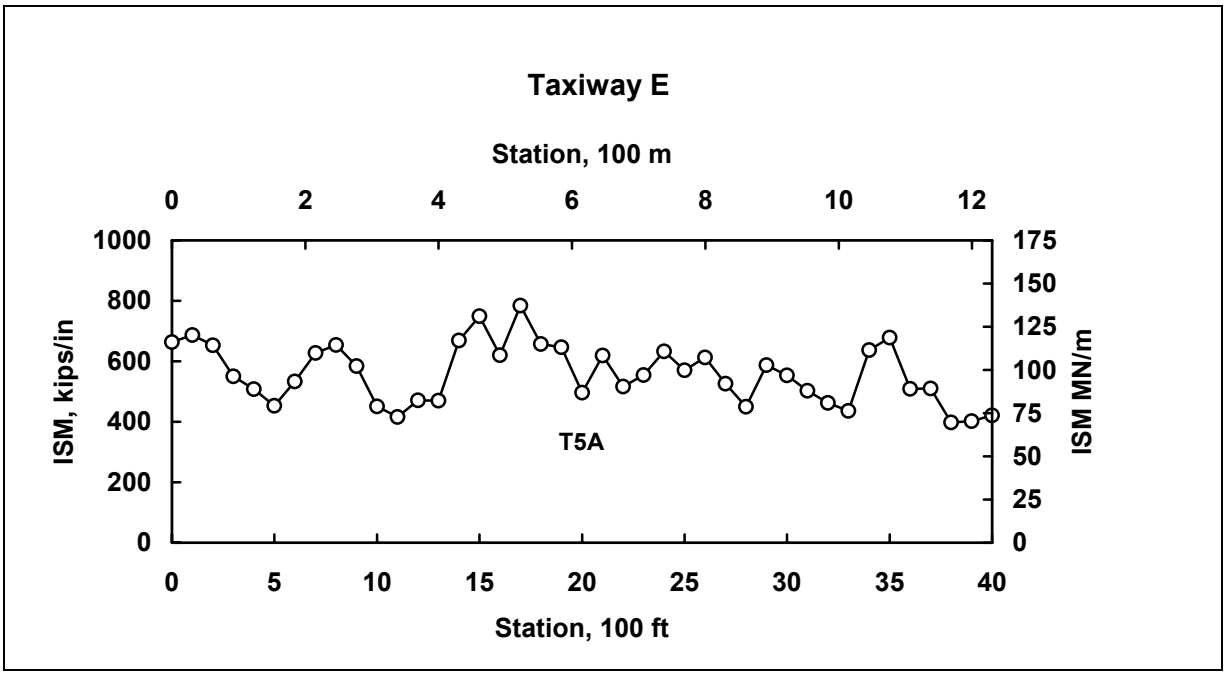

Figure B6. ISM profile, Taxiway E, Feature T5A

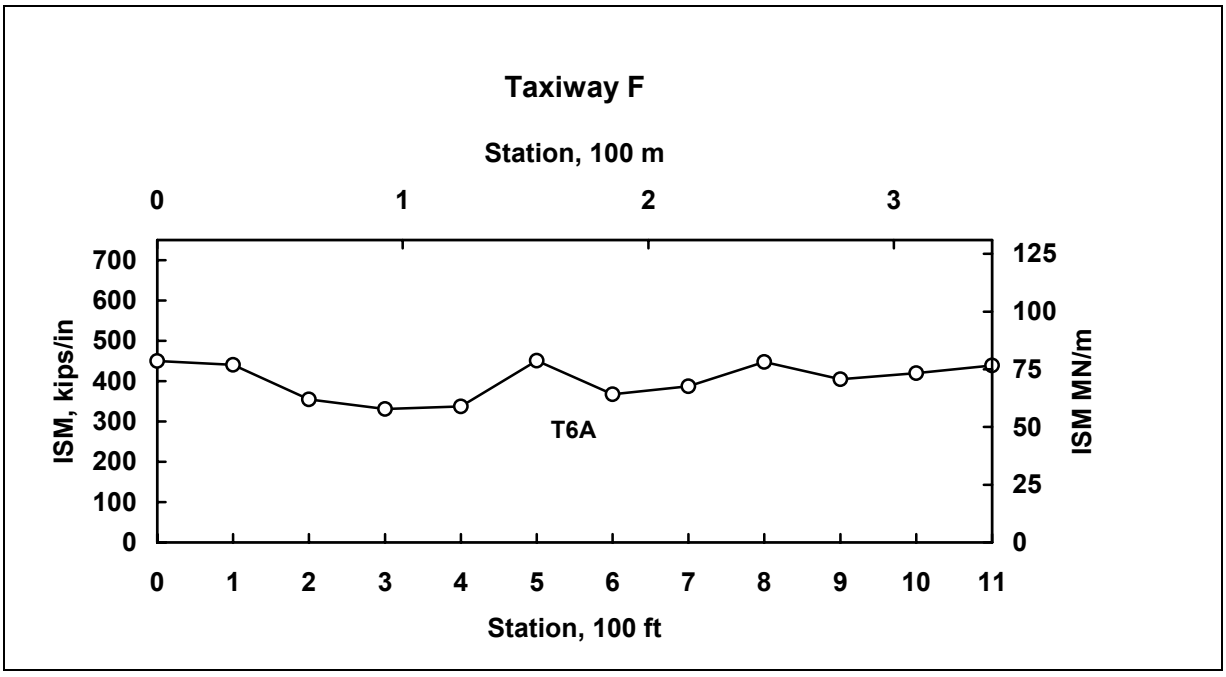

Figure B7. ISM profile, Taxiway F, Feature T6A

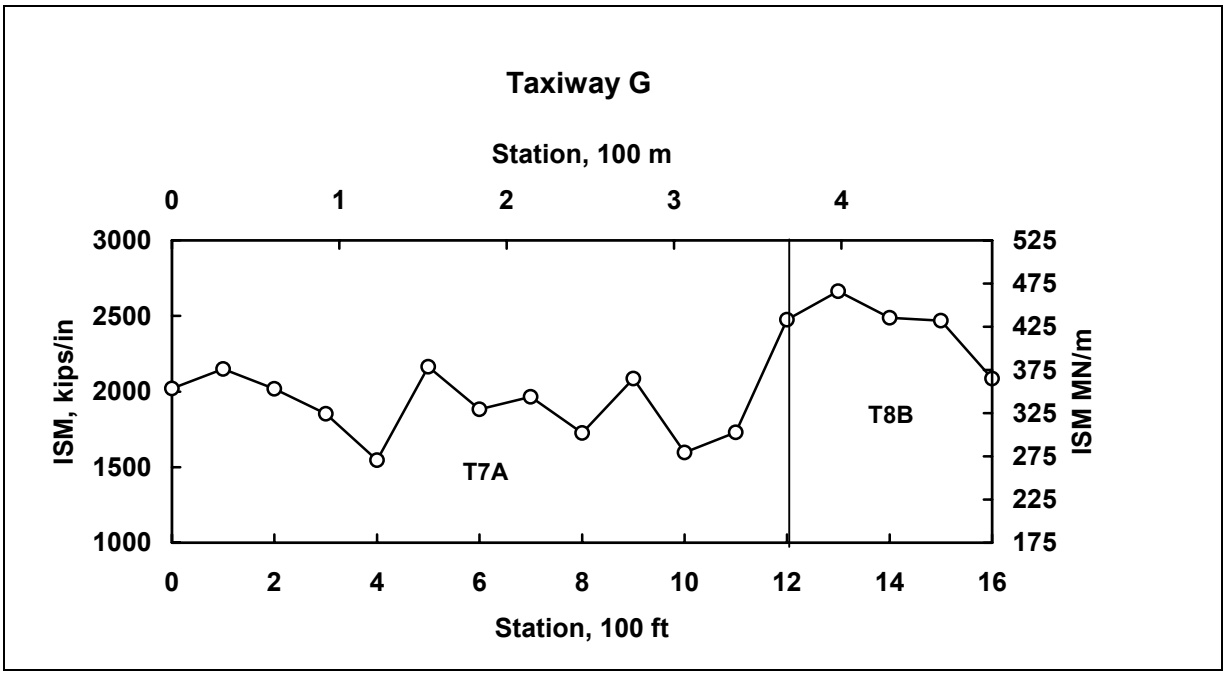

Figure B8. ISM profile, Taxiway G, Features T7A and T8B

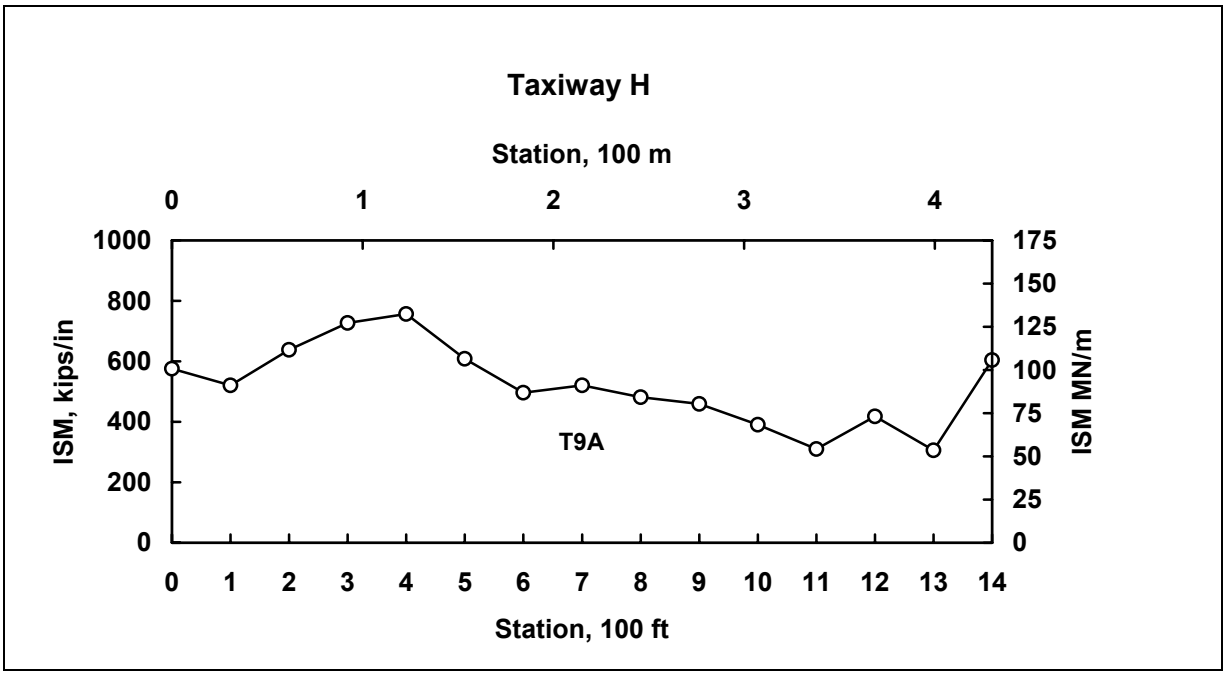

Figure B9. ISM profile, Taxiway H, Feature T9A

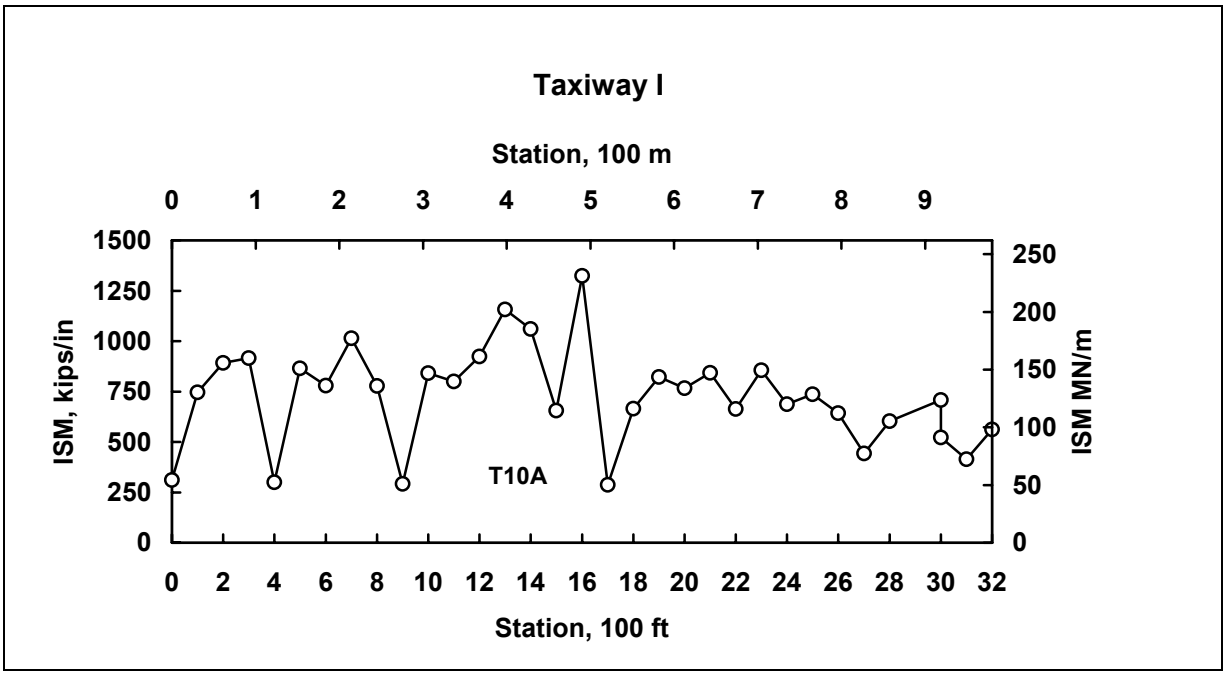

Figure B10. ISM profile, Taxiway I, Feature T10A

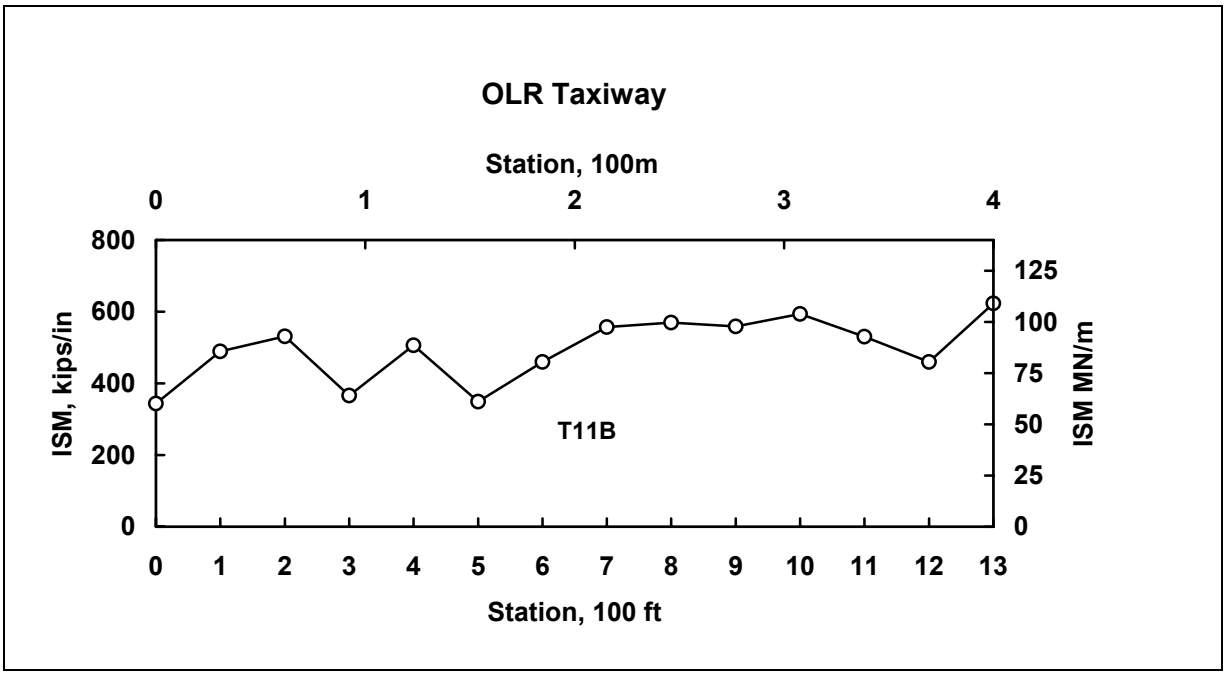

Figure B11. ISM profile, OLR Taxiway, Feature T11B

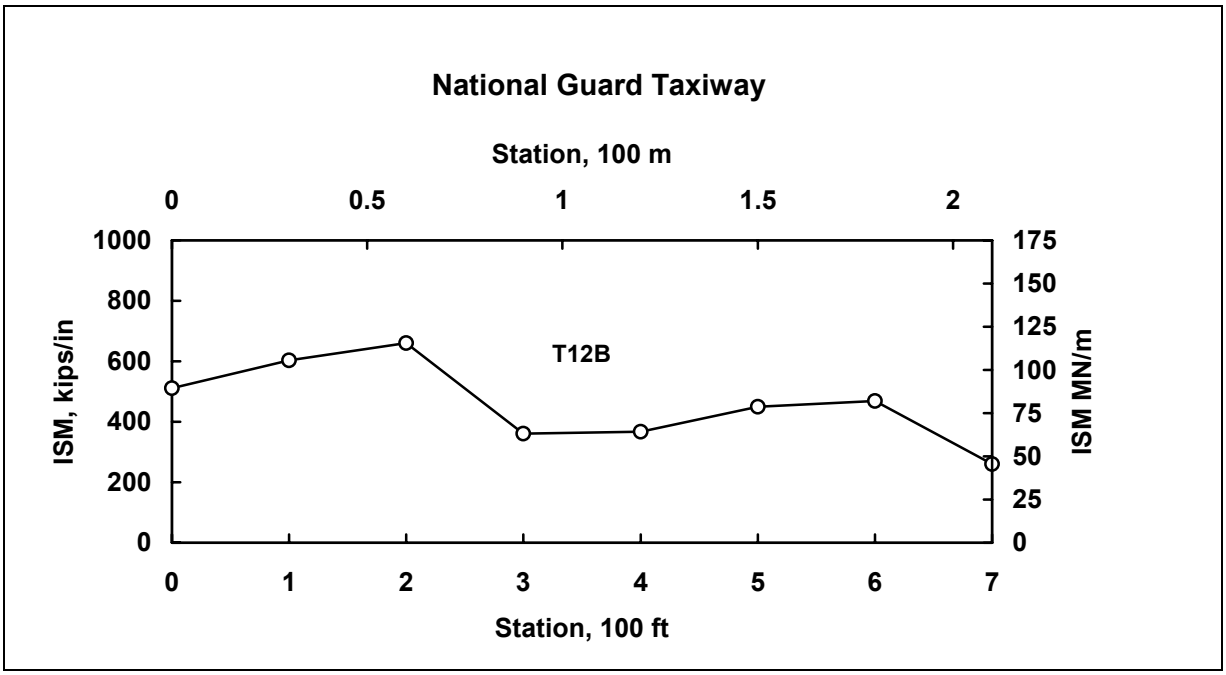

Figure B12. ISM profile, National Guard Taxiway, Feature T12B

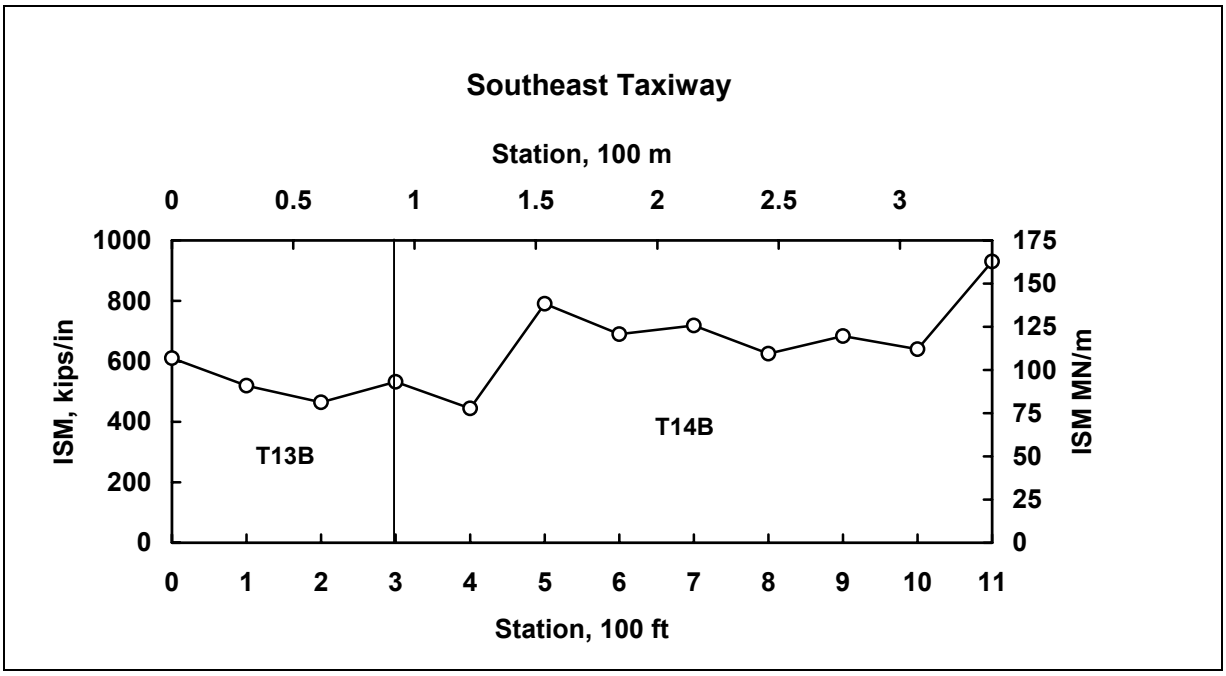

Figure B13. ISM profile, Southeast Taxiway, Features T13B and T14B

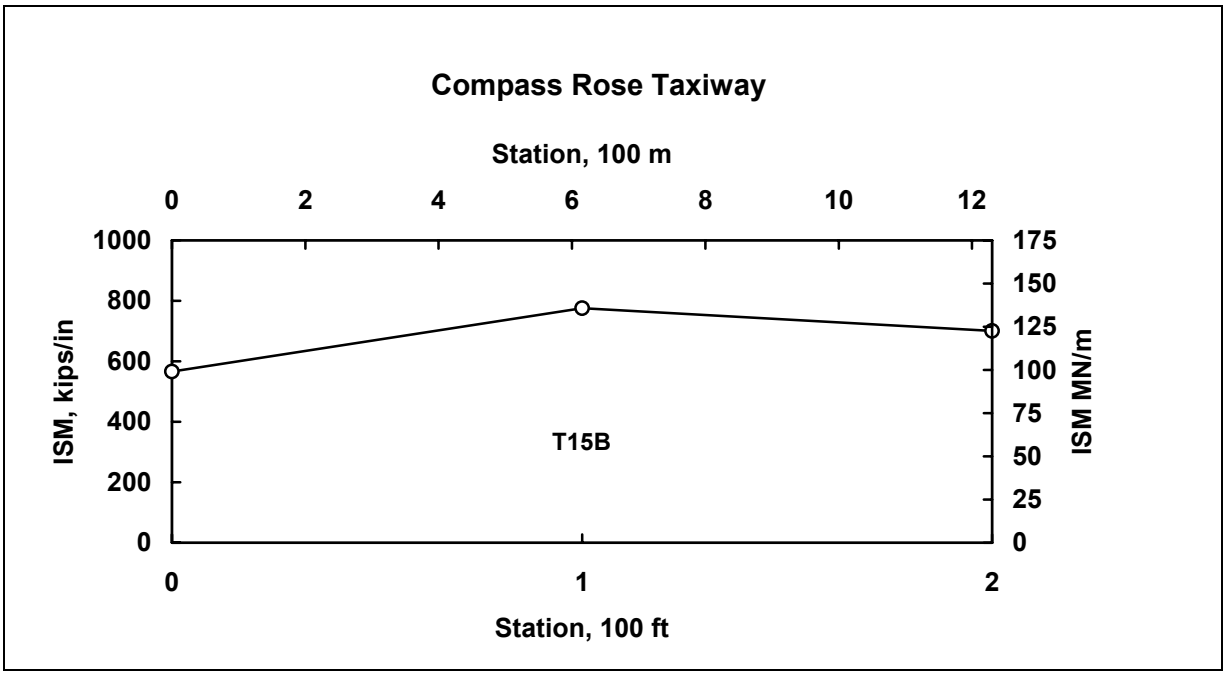

Figure B14. ISM profile, Compass Rose Taxiway, Feature T15B

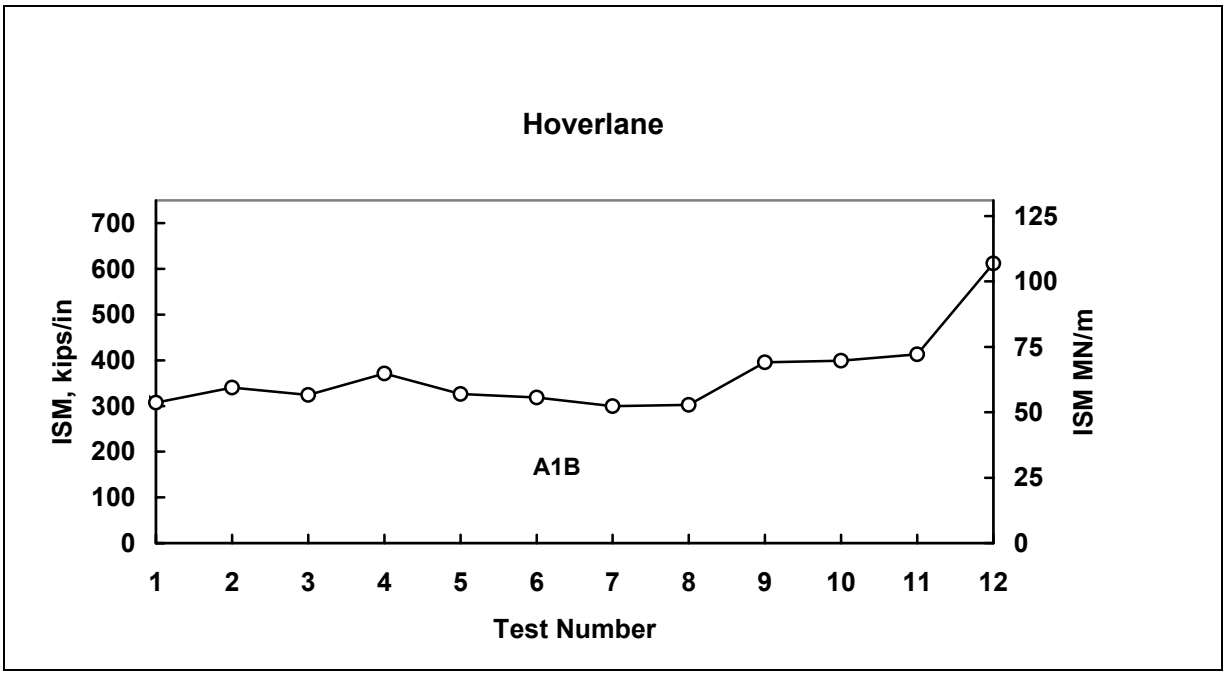

Figure B15. ISM profile, Hoverlane, Feature A1B

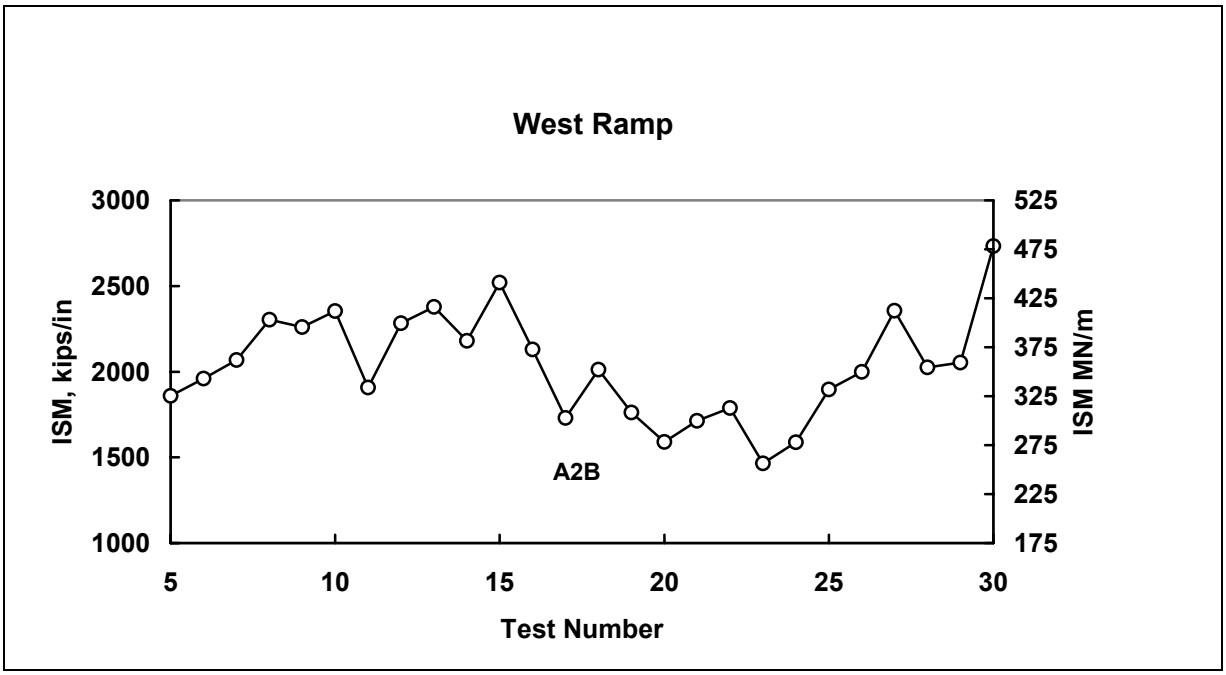

Figure B16. ISM profile, West Ramp, Feature A2B

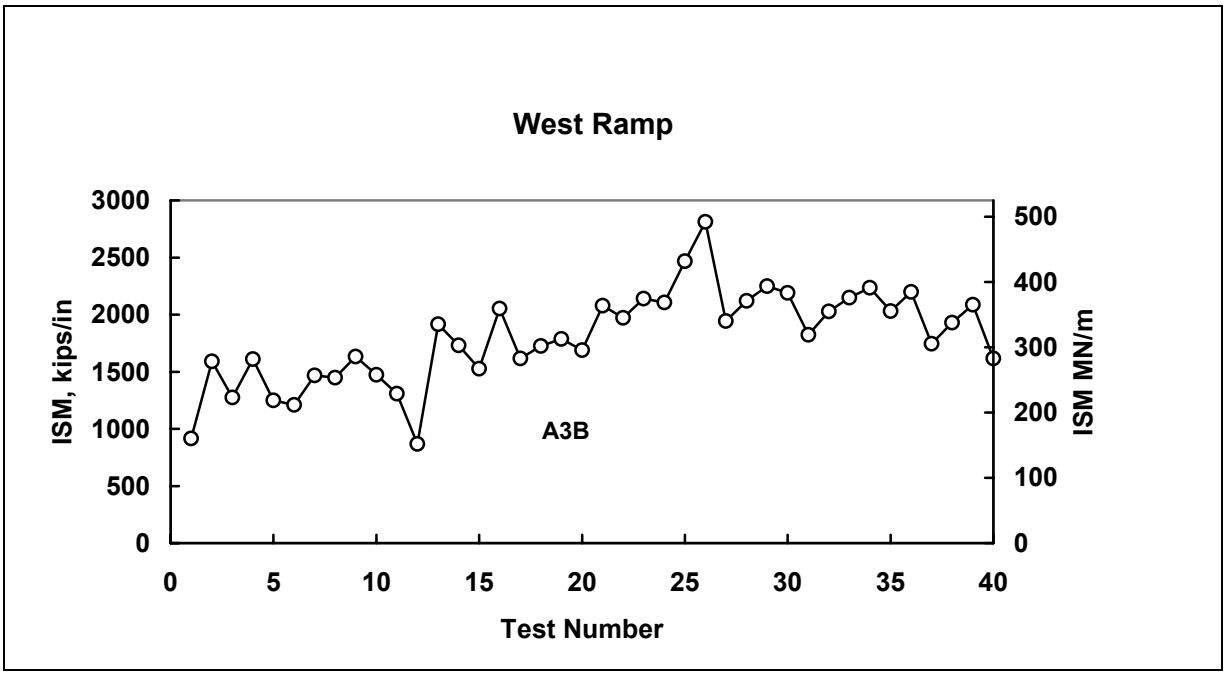

Figure B17. ISM profile, West Ramp, Feature A3B

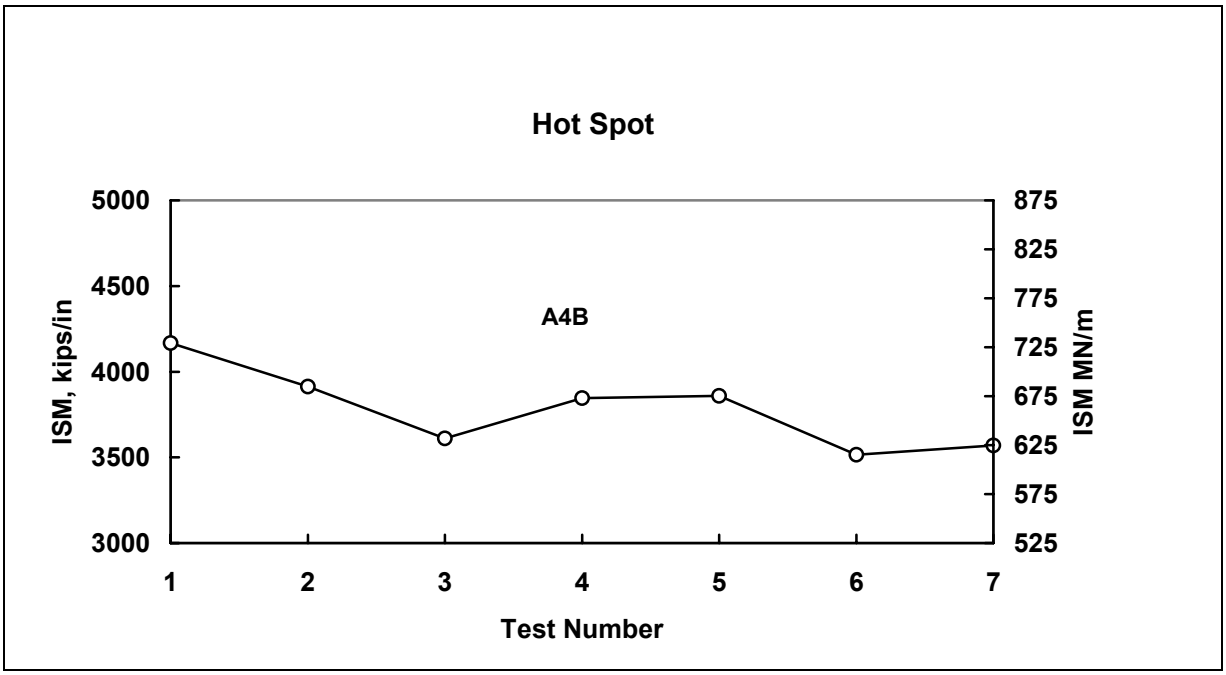

Figure B18. ISM profile, Hot Spot, Feature A4B

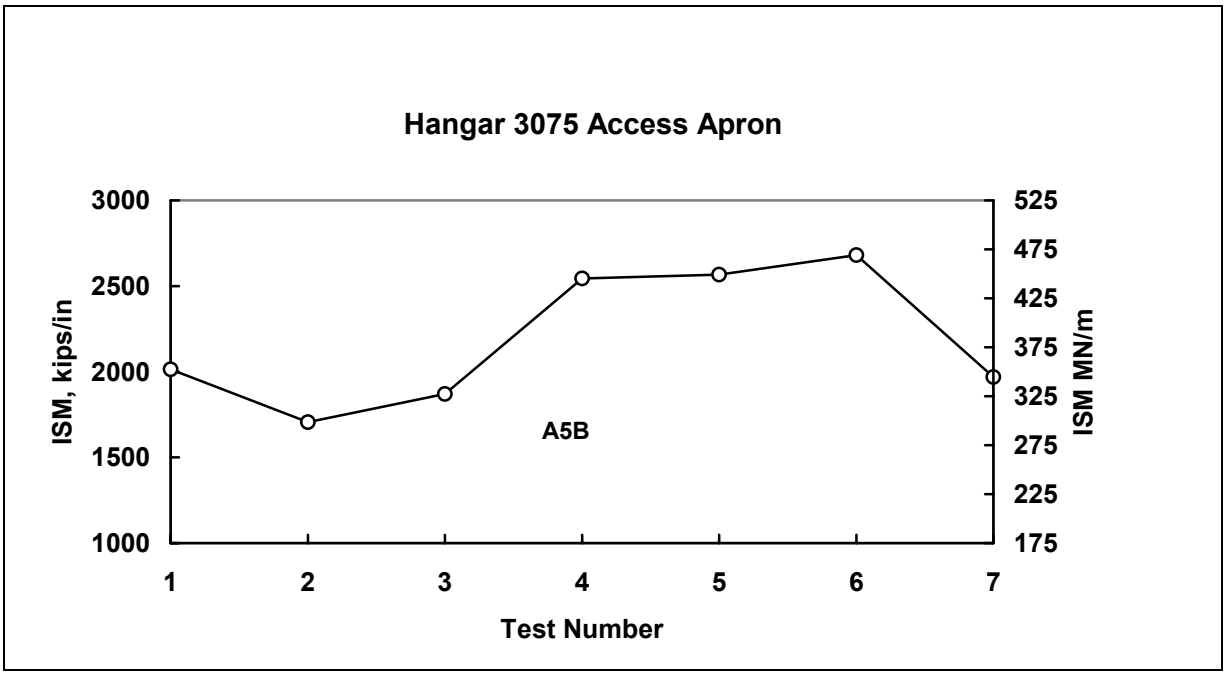

Figure B19. ISM profile, Hangar 3075 access Apron, Feature A5B

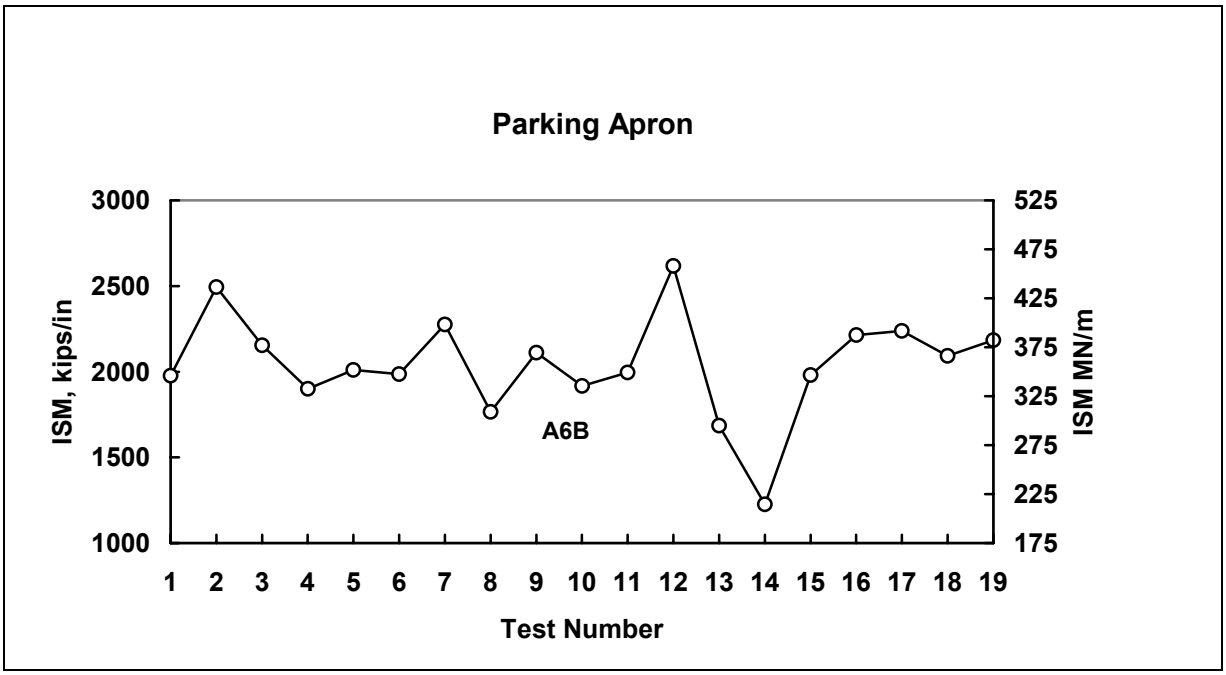

Figure B20. ISM profile, Parking Apron, Feature A6B

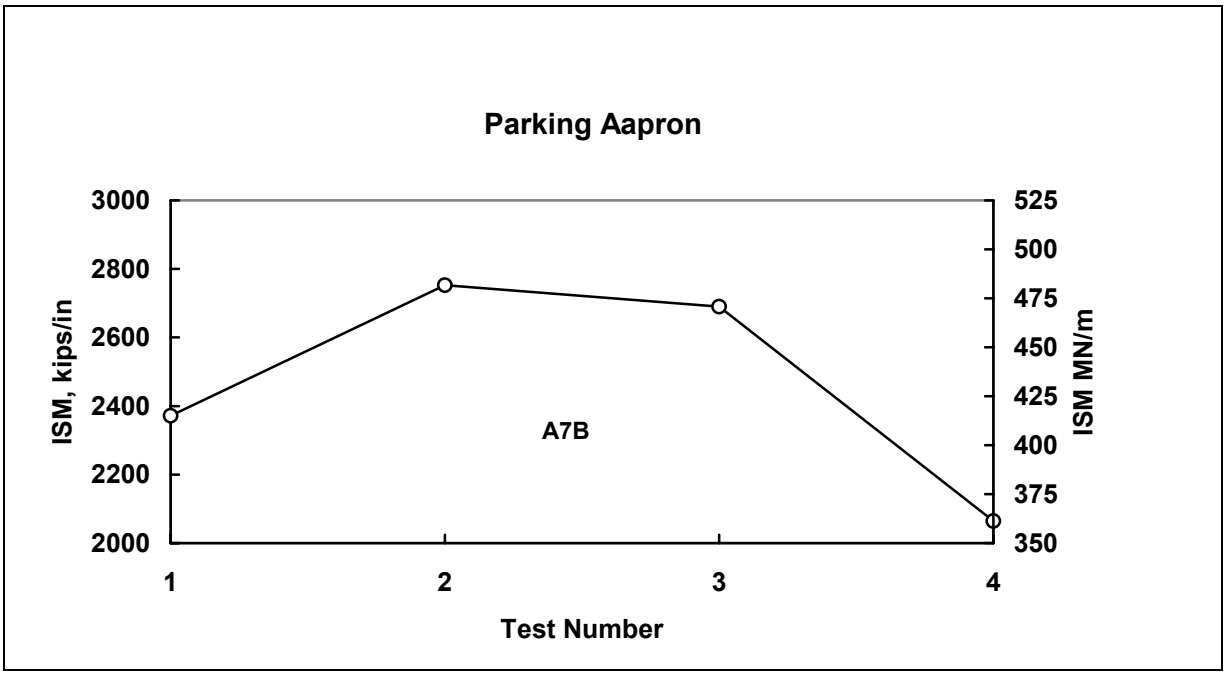

Figure B21. ISM profile, Parking Apron, Feature A7B

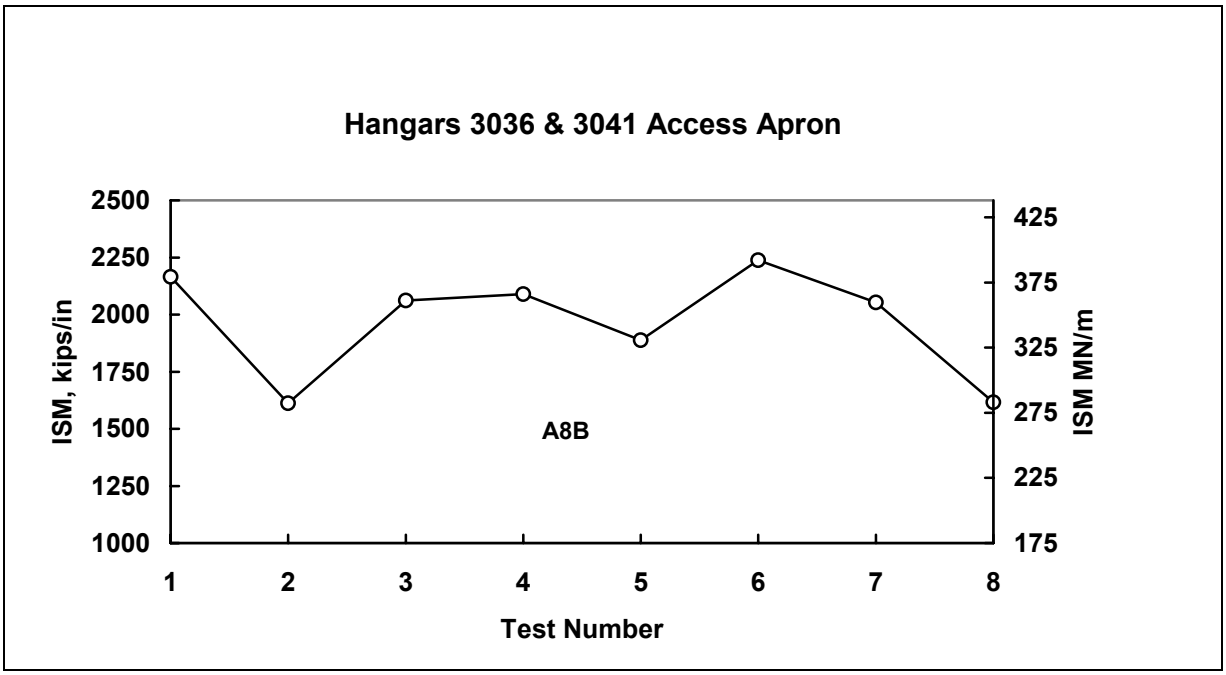

Figure B22. ISM profile, Hangars 3036 & 3041 Access Apron, Feature A8B

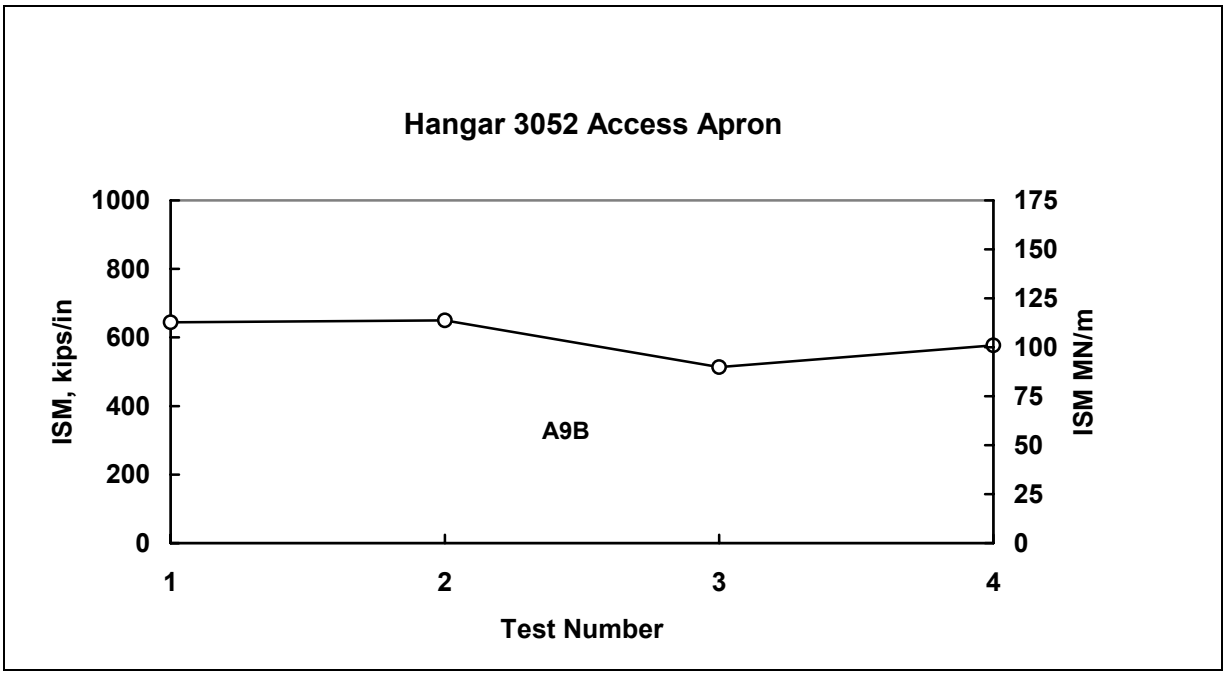

Figure B23. ISM profile, Hangar 3052 Access Apron, Feature A9B

Figure B24. ISM profile, South Apron, Feature A10B

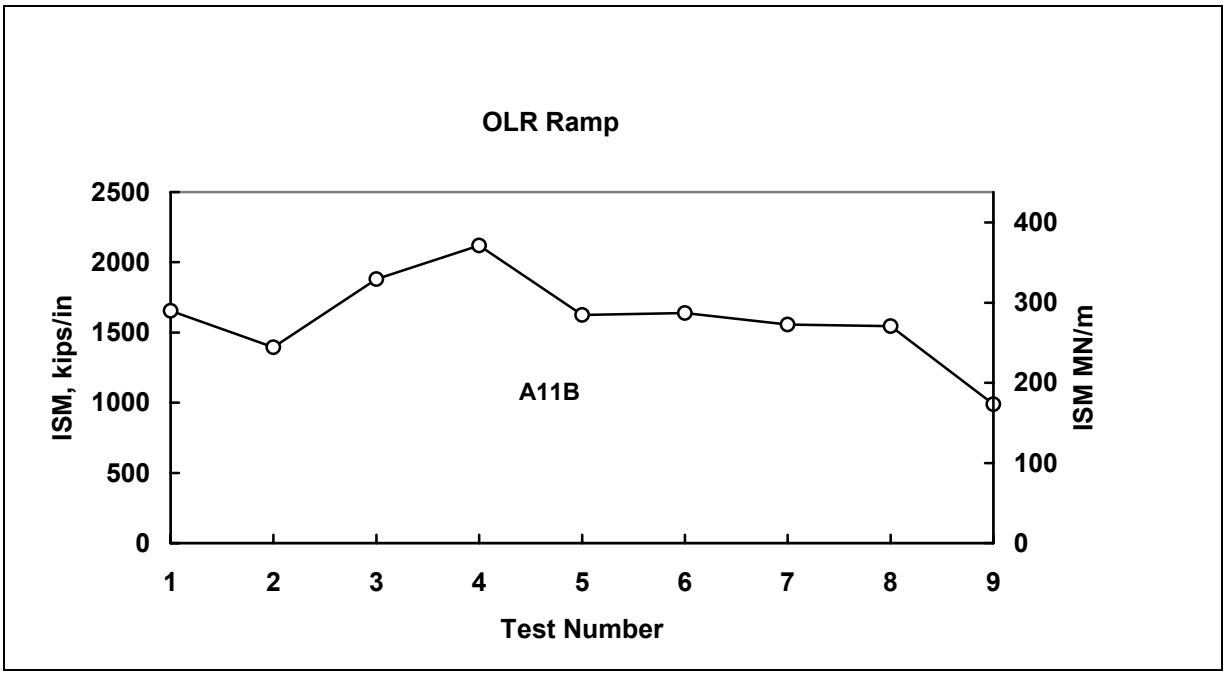

Figure B25. ISM profile, OLR Ramp, Feature A11B

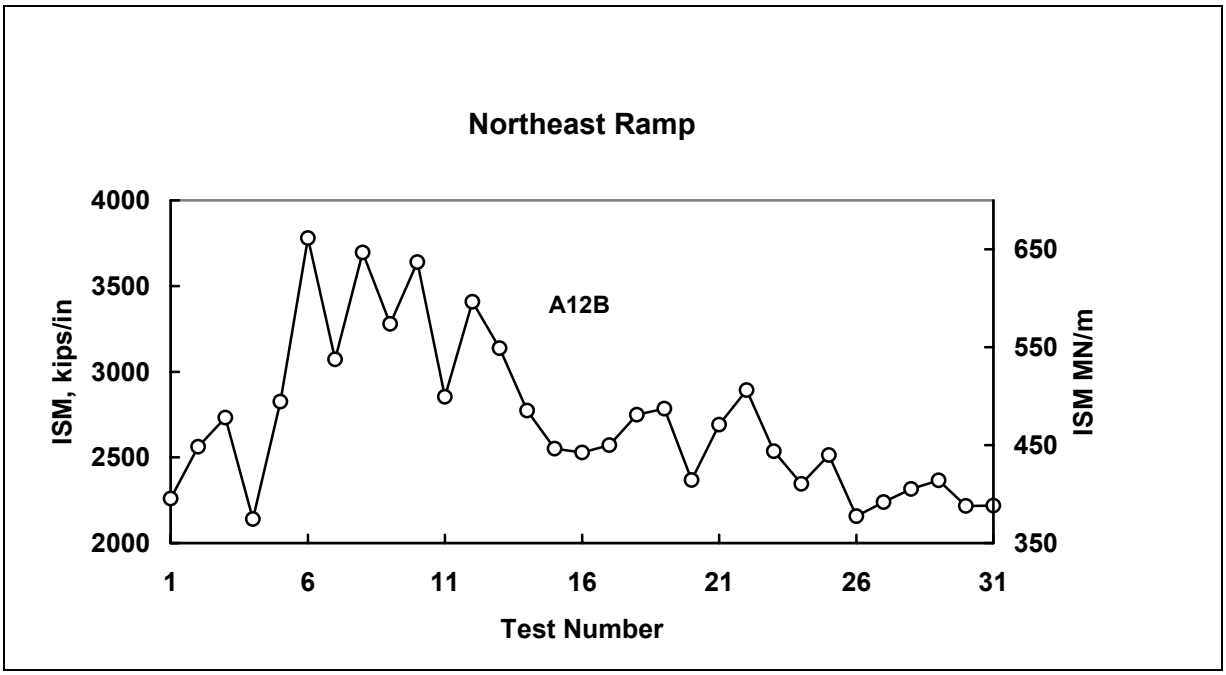

Figure B26. ISM profile, Northeast Ramp, Feature A12B

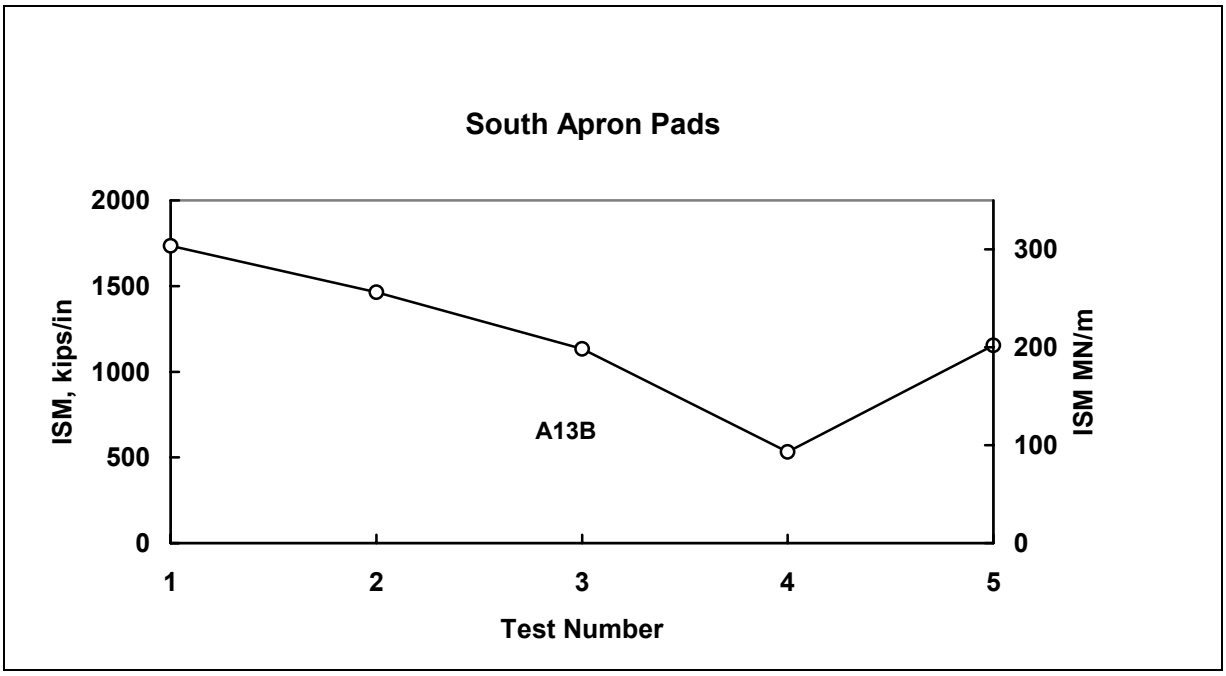

Figure B27. ISM profile, South Apron Pads, Feature A13B

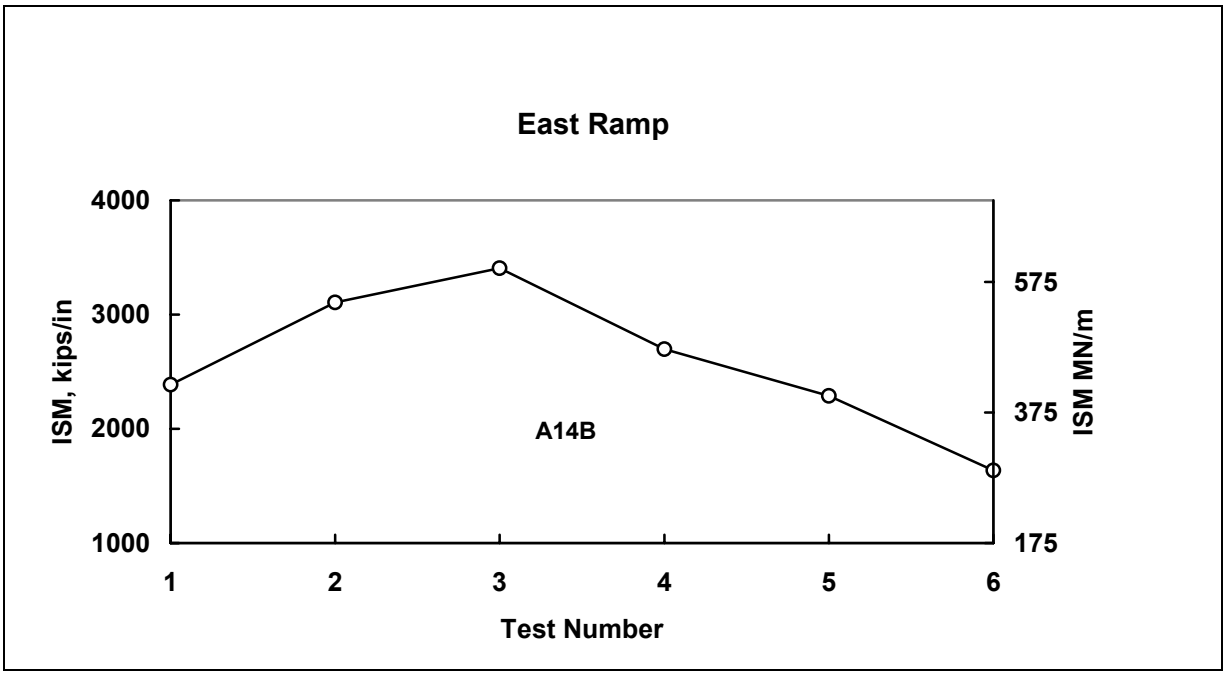

Figure B28. ISM profile, East Ramp, Feature A14B

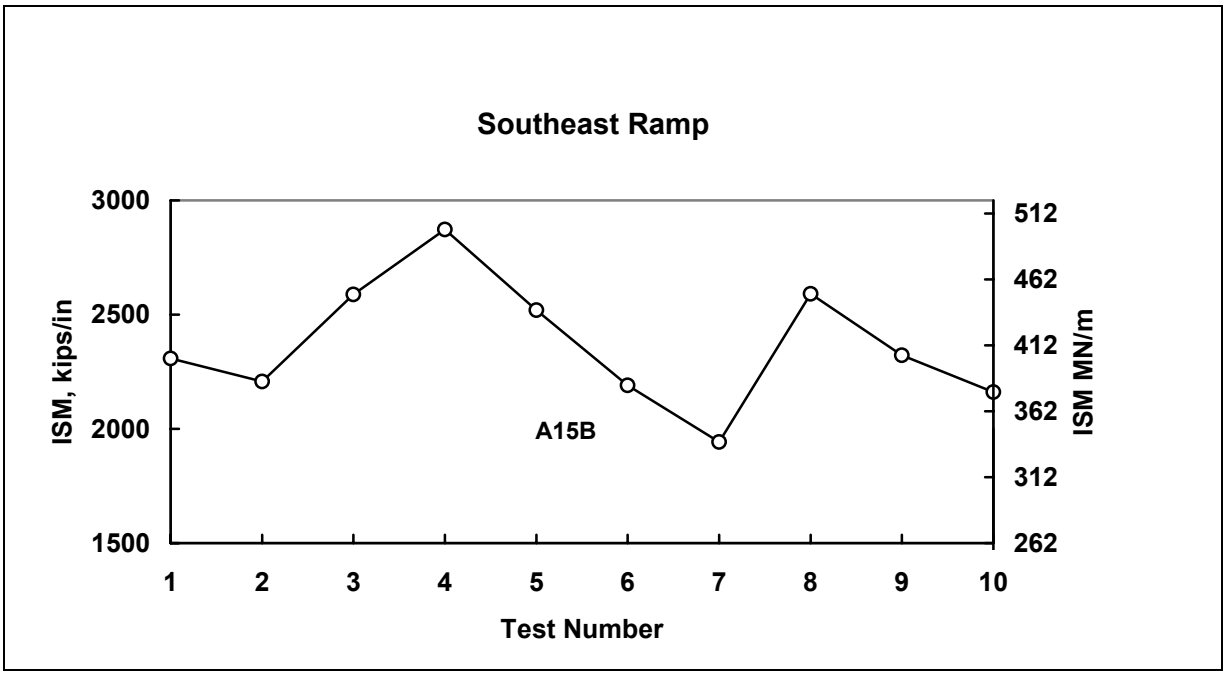

Figure B29. ISM profile, Southeast Ramp, Feature A15B

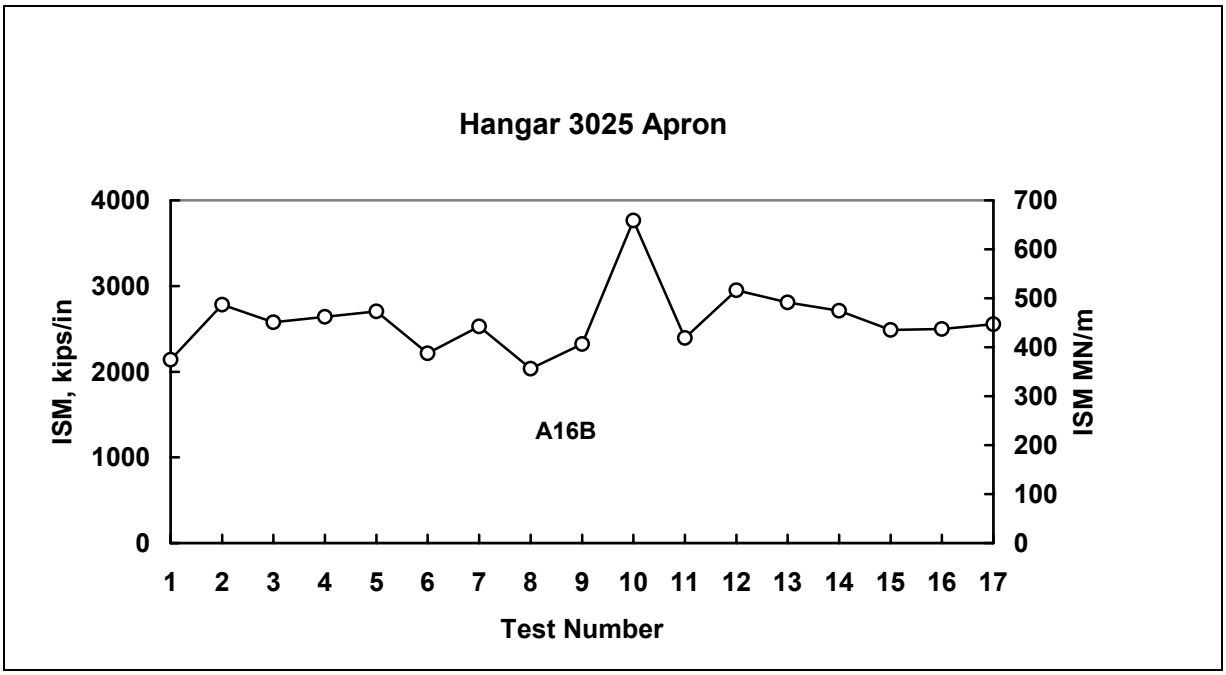

Figure B30. ISM profile, Hangar 3025 Apron, Feature A16B

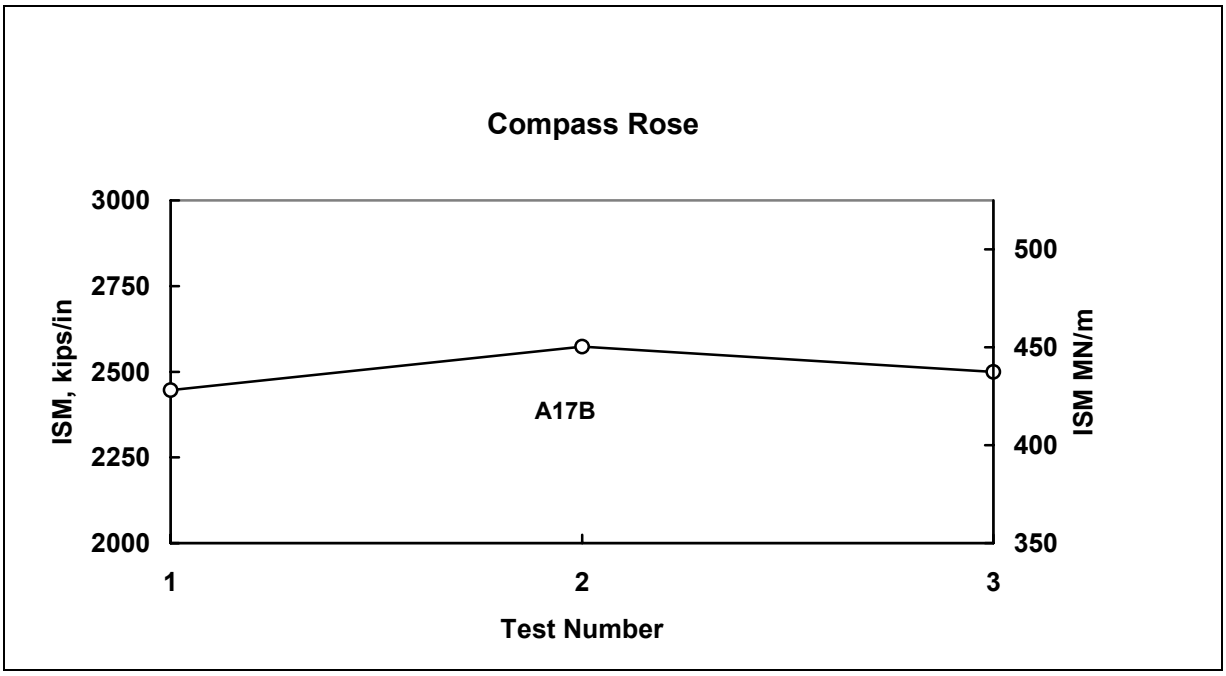

Figure B31. ISM profile, Compass Rose, Feature A17B

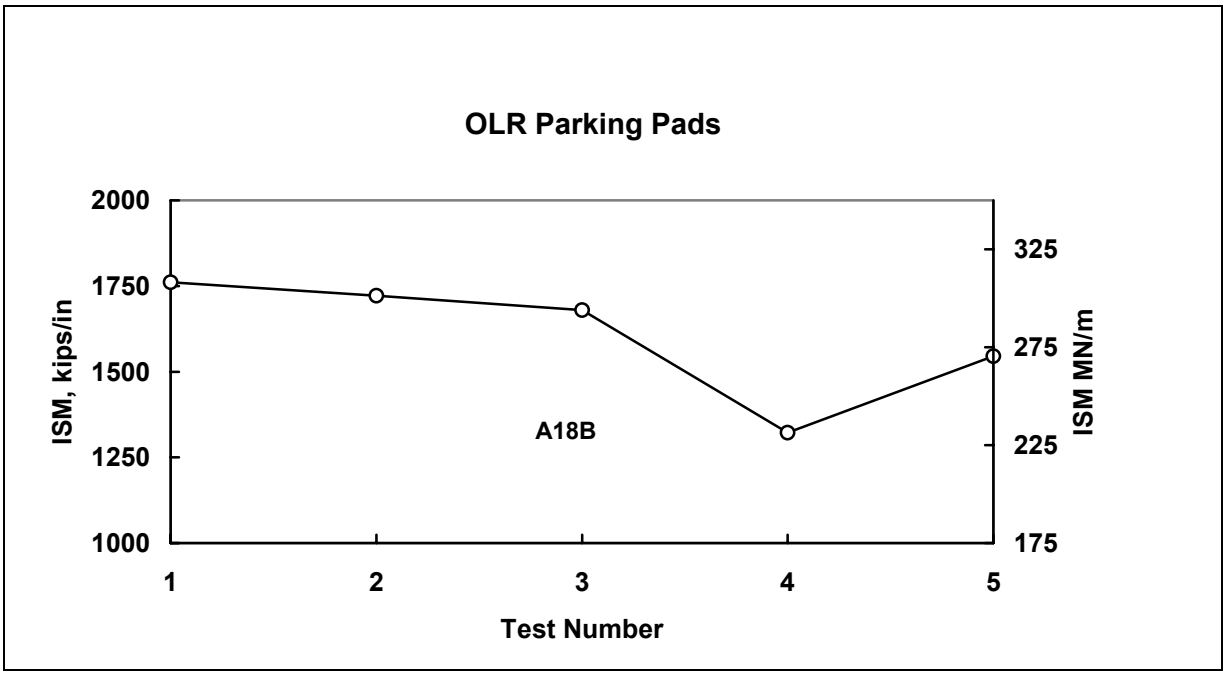

Figure B32. ISM profile, OLR Parking Pads, Feature A18B

Table B1
NDT Test Results, Representative Basins

Feature	ISM MN/m (kips/in.)	Load kN (lb)	Deflection, µm (mils) D1	D2	D3	D4	D5	D6	D7
Runway 15-33									
R1A	174 (991)	177 (39,825)	1021 (40.2)	795 (31.3)	450 (17.7)	277 (10.9)	173 (6.8)	117 (4.6)	89 (3.5)
R2C	201 (1,151)	170 (38,216)	843 (33.2)	577 (22.7)	292 (11.5)	173 (6.8)	112 (4.4)	81 (3.2)	61 (2.4)
R3A	155 (887)	167 (37,588)	1077 (42.4)	790 (31.1)	419 (16.5)	244 (9.6)	145 (5.7)	97 (3.8)	74 (2.9)
Taxiway A									
T1A	117 (669)	137 (30,906)	1173 (46.2)	704 (27.7)	155 (11.3)	368 (6.1)	102 (4.0)	76 (3.0)	56 (2.2)
Taxiway B									
T2C	115 (657)	133 (30,040)	1161 (45.7)	703 (27.7)	269 (10.6)	117 (4.6)	71 (2.8)	61 (2.4)	61 (2.4)
T3B	134 (764)	134 (30,159)	1001 (39.4)	589 (23.2)	236 (9.3)	119 (4.7)	71 (2.8)	58 (2.3)	53 (2.1)
Taxiway C									
T4B	92 (523)	130 (29,182)	1420 (55.9)	737 (29.0)	236 (9.3)	89 (3.5)	51 (2.0)	51 (2.0)	56 (2.2)
Taxiway E									
T5A	97 (555)	130 (29,361)	1 247 (52.9)	693 (27.3)	427 (16.8)	277 (10.9)	178 (7.0)	114 (4.5)	84 (3.3)
Taxiway F									
T6A	74 (421)	134 (30,211)	1826 (71.9)	1105 (43.5)	452 (17.8)	226 (8.9)	147 (5.8)	107 (4.2)	94 (3.7)
Taxiway G									
T7A	365 (2,027)	178 (40,043)	488 (19.2)	470 (18.5)	335 (13.2)	251 (9.9)	180 (7.1)	122 (4.8)	74 (2.9)
T8B	432 (2,468)	180 (40,595)	419 (16.5)	396 (15.6)	272 (10.7)	198 (7.8)	140 (5.5)	94 (3.7)	56 (2.2)
Taxiway H									
T9A	91 (521)	98 (22,163)	1082 (42.6)	577 (22.7)	224 (8.8)	119 (4.7)	74 (2.9)	56 (2.2)	48 (1.9)
Taxiway I									
T10A	136 (778)	173 (38,915)	1270 (50.0)	805 (31.7)	378 (14.9)	206 (8.1)	124 (4.9)	89 (3.5)	71 (2.8)
OLR Taxiway									
T11B	93 (530)	97 (21,825)	1059 (41.7)	404 (15.9)	137 (5.4)	81 (3.2)	66 (2.6)	53 (2.1)	46 (1.8)
National Guard Taxiway									
T12B	82 (467)	94 (21,265)	1153 (45.4)	589 (23.2)	203 (8.0)	109 (4.3)	74 (2.9)	56 (2.2)	46 (1.8)
Southeast Taxiway									
T13B	93 (532)	127 (28,523)	1361 (53.6)	869 (34.2)	386 (15.2)	203 (8.0)	107 (4.2)	64 (2.5)	38 (1.5)
T14B	121 (691)	131 (29,576)	1087 (42.8)	625 (24.6)	251 (9.9)	145 (5.7)	97 (3.8)	74 (2.9)	58 (2.3)
Compass Rose Taxiway									
T15B	123 (700)	100 (22,457)	815 (32.1)	470 (18.5)	191 (7.5)	99 (3.9)	64 (2.5)	46 (1.8)	38 (1.5)

(Sheet 1 of 3)

Table B1 (Continued)

Feature	ISM MN/m (kips/in.)	Load kN (lb)	Deflection, µm (mils) D1	D2	D3	D4	D5	D6	D7
Hoverlane									
A1B	79 (455)	98 (21,984)	1227 (48.3)	787 (31.0)	328 (12.9)	160 (6.3)	86 (3.4)	58 (2.3)	46 (1.8)
West Ramp									
A2B	352 (2,012)	172 (38,839)	490 (19.3)	457 (18.0)	307 (12.1)	218 (8.6)	150 (5.9)	99 (3.9)	56 (2.2)
A3B	335 (1,913)	175 (39,404)	523 (20.6)	511 (20.1)	368 (14.5)	279 (11.0)	201 (7.9)	137 (5.4)	91 (3.6)
Hot Spot									
A4B	685 (3,913)	178 (39,995)	259 (10.2)	251 (9.9)	180 (7.1)	140 (5.5)	107 (4.2)	76 (3.0)	53 (2.1)
Hangar 3075 Access Apron									
A5B	352 (2,011)	176 (39,618)	500 (19.7)	488 (19.2)	348 (13.7)	264 (10.4)	188 (7.4)	127 (5.0)	81 (3.2)
Parking Apron									
A6B	349 (1,993)	172 (38,665)	493 (19.4)	483 (19.0)	348 (13.7)	267 (10.5)	196 (7.7)	137 (5.4)	91 (3.6)
A7B	415 (2,374)	178 (40,123)	430 (16.9)	404 (15.9)	274 (10.8)	201 (7.9)	145 (5.7)	99 (3.9)	67 (2.7)
Hangars 3036 & 3041 Access Apron									
A8B	331 (1,892)	172 (38,776)	521 (20.5)	500 (19.7)	356 (14.0)	272 (10.7)	201 (7.9)	145 (5.7)	97 (3.8)
Hangar 3052 Access Apron									
A9B	113 (643)	100 (22,409)	884 (34.8)	617 (24.3)	287 (11.3)	155 (6.1)	89 (3.5)	56 (2.2)	46 (1.8)
South Apron									
A10B	80 (455)	70 (15,819)	884 (34.8)	386 (15.2)	114 (4.5)	61 (2.4)	41 (1.6)	33 (1.3)	28 (1.1)
OLR Ramp									
A11B	370 (2,116)	180 (40,421)	485 (19.1)	480 (18.9)	351 (13.8)	267 (10.5)	191 (7.5)	122 (4.8)	76 (3.0)
Northeast Ramp									
A12B	478 (2,732)	177 (39,888)	371 (14.6)	335 (13.2)	221 (8.7)	160 (6.3)	114 (4.5)	84 (3.3)	61 (2.4)
South Apron Pads									
A13B	303 (1,732)	175 (39,316)	577 (22.7)	556 (21.9)	381 (15.0)	277 (10.9)	191 (7.5)	127 (5.0)	86 (3.4)
East Ramp									
A14B	471 (2,692)	180 (40,373)	381 (15.0)	373 (14.7)	272 (10.7)	211 (8.3)	160 (6.3)	119 (4.7)	86 (3.4)
Southeast Ramp									
A15B	405 (2,314)	177 (39,797)	437 (17.2)	411 (16.2)	282 (11.1)	208 (8.2)	150 (5.9)	104 (4.1)	69 (2.7)
Hangar 3025 Apron									
A16B	450 (2,573)	180 (40,397)	399 (15.7)	381 (15.0)	267 (10.5)	198 (7.8)	145 (5.7)	99 (3.9)	69 (2.7)
Compass Rose									
A17B	427 (2,442)	179 (40,285)	419 (16.5)	396 (15.6)	272 (10.7)	201 (7.9)	145 (5.7)	104 (4.1)	74 (2.9)

(Sheet 2 of 3)

Table B1 (Concluded)

Feature	ISM MN/m (kips/in.)	Load kN (lb)	Deflection, µm (mils)						
			D1	D2	D3	D4	D5	D6	D7
OLR Parking Pads									
A18B	301 (1,720)	174 (39,038)	577 (22.7)	546 (21.5)	401 (15.8)	292 (11.5)	198 (7.8)	130 (5.1)	81 (3.2)

(Sheet 3 of 3)

Table B2
Summary of Modulus Values[1]

Feature	Surface Modulus MPa (psi[1])	Base Modulus MPa (psi[1])	Subbase Modulus MPa (psi[1])	Subgrade Modulus MPa (psi[1])
PCC Pavements				
T7A	48 265 (7,001,056)	182 (26,473)[2]	--	182 (26,473)[2]
T8A	49 398 (7,165,353)	--	--	266 (38,549)
A2B	61 425 (5,066,883)	--	--	250 (36,321)
A3B	48 261 (7,000,400)	174 (25,291)[2]	--	174 (25,291)[2]
A4B	52 710 (7,645,732)	--	--	332 (48,226)
A5B	48 382 (7,018,046)	--	--	188 (27,339)
A6B	54 484 (7,903,131)	176 (25,489)[2]	--	176 (25,489)[2]
A7B	52 100 (7,557,342)	--	--	243 (35,281)
A8B	51 449 (7,462,907)	--	--	171 (24,731)
A11B	49 633 (7,199,454)	--	--	196 (28,383)
A12B	50 274 (7,292,452)	1551 (225,000)	--	350 (50,770)
A13B	34 445 (4,996,421)	--	--	168 (24,428)
A14B	35 439 (5,140,559)	1551 (225,000)	--	189 (27,384)
A15B	51 219 (7,429,459)	234 (33,931)[2]	--	234 (33,931)[2]
A16B	61 112 (8,864,619)	247 (35,826)[2]	--	247 (35,826)[2]
A17B	57 944 (8,405,044)[2]	239 (34,758)[2]	--	239 (34,758)[2]
A18B	35 444 (5,141,305)	--	--	172 (25,025)
AC Pavements[3]				
R1A	13 106 (1,901,025)	347 (50,387)	--	169 (24,489)
R2C	16 190 (2,348,410)	279 (40,469)	--	245 (35,519)
R3A	12 746 (1,848,813)	361 (52,464)	--	186 (26,963)
T1A	11 797 (1,711,254)	359 (52,074)	--	184 (26,649)
T2C	11 627 (1,686,487)	377 (54,726)	--	199 (28,830)
T3B	11 438 (1,659,063)	418 (60,620)	--	235 (34,056)

(Continued)

[1] Backcalculated modulus values using WESDEF.
[2] Base and subgrade were combined.
[3] AC modulus based on temperature at the time of testing.

Table B2 (Concluded)

Feature	Surface Modulus MPa (psi[1])	Base Modulus MPa (psi[1])	Subbase Modulus MPa (psi[1])	Subgrade Modulus MPa (psi[1])
AC Pavements				
T4B	11 419 (1,656,326)	440 (63,811)	--	256 (37,126)
T5B	11 438 (1,659,063)	324 (47,000)	--	157 (22,743)
T6B	12 581 (1,824,860)	268 (38,860)	--	118 (17,139)
T9A	11 627 (1,686,487)	370 (53,753)	--	193 (28,018)
T10A	13 157 (1,908,502)	383 (55,550)	--	198 (29,528)
T11B	10 875 (1,577,457)	116 (16,876)	--	218 (31,621)
T12B	10 689 (1,550,512)	140 (20,256)	--	178 (25,795)
T13B	11 419 (1,656,326)	436 (63,346)	--	253 (36,668)
T14B	11 419 (1,656,326)	411 (59,716)	--	203 (29,447)
T15B	11 438 (1,659,063)	362 (52,606)	--	277 (40,147)
A1B	11 418 (1,824,860)	342 (49,628)	--	170 (24,724)
A9B	11 389 (1,651,956)	307 (44,535)	--	144 (20,964)
A10B	11 155 (1,618,063)	187 (27,140)	--	215 (31,144)

[1] Backcalculated modulus values using WESDEF.
[2] Base and subgrade were combined.
[3] AC modulus based on temperature at the time of testing.

Appendix C
Pavement Condition Survey and Results

Pavement Condition Survey

A pavement condition survey is a visual inspection of the airfield pavements to determine the present surface condition. The condition survey consists of inspecting the pavement surface for various types of distress, determining the severity of each distress, and measuring the quantity of each distress. The estimated quantities and severity of each distress type are used to compute the PCI for each feature. The PCI is a numerical indicator based on a scale from 0 to 100 and is determined by measuring pavement surface distress that reflects the surface condition of the pavement. Pavement condition ratings (from excellent to failed) are assigned to different levels of PCI values. These ratings and their respective PCI value definitions are shown in Figure C1. The distress types, severity levels, methods of survey, and PCI calculations are described in ASTM D5340-93.

The PCI and estimated distress quantities are determined for each feature. The information is based on inspection of a selected number of sample units. Sample units are subdivisions of a feature used exclusively to facilitate the inspection process and reduce the effort needed to determine distress quantities and the PCI. Each feature was divided into sample units. The sample units for AC pavement features were approximately 465 sq m (5,000 sq ft). A statistical sampling technique was used to determine the number of sample units to be inspected to provide a 95 percent confidence level. Sample units were chosen along the centerline of the taxiways and randomly on the runway and on the aprons. Sample unit locations for the various runway features are shown in Figures C2. Sample unit locations for the PCC taxiway and apron features are shown in Figures C3 through C15. The surveyed sample units are circled. After the sample units were inspected, the mean PCI of all sample units within a feature was calculated and the feature was rated as to its condition: excellent, very good, good, fair, poor, very poor, or failed.

Analysis of PCI Data

The distress information collected during the survey was used with the Micro PAVER computer program to estimate the quantities of distress types for each feature. This information is presented along with the PCI, general rating, and distress mechanism (load, climate, or other) in Appendix E. Photos C1 through C10 show various types of distresses observed during the survey.

AR 420-72 (Headquarters, Department of the Army 2000) requires that all airfield pavements be maintained at or above the following PCI ranges:

All runways > 70
All primary taxiways ≥ 60
All aprons and secondary taxiways > 55

AR 420-72 (Headquarters, Department of the Army 2000) also requires that the following PCI range for airfield pavements shall be used for the Installation Status Report (ISR) rating:

70 < PCI ≤ 100 equals an ISR Green rating
55 < PCI ≤ 70 equals an ISR Amber rating
0 < PCI ≤ 55 equals an ISR Red rating

The PCI for each sample unit inspected was calculated and stored on a Micro PAVER file for GAAF. The mean PCI for each feature was then calculated to determine the general condition or rating of the feature as shown in Figure C16. A comparison of the 2001, 1994, and 1989 PCI results is summarized in Table C1. The PCI of the runway features decreased from six to twelve points during the 1994 to 2001 period. This loss in PCI points is considered normal (4 to 6 points per year). The PCI of all but two of the taxiway features and all but six of the apron features decreased from one to twenty-seven points during the 1994 to 2001 period. One taxiway feature and six apron features had an increase in PCI of 1 to three points which was attributed to judging the distresses less severe in 2001 as compared to their severity in 1994. The PCI of feature T3B increased by thirty-three points. Bleeding was detected on the surface of T3B in 1994 and was not observed in 2001.

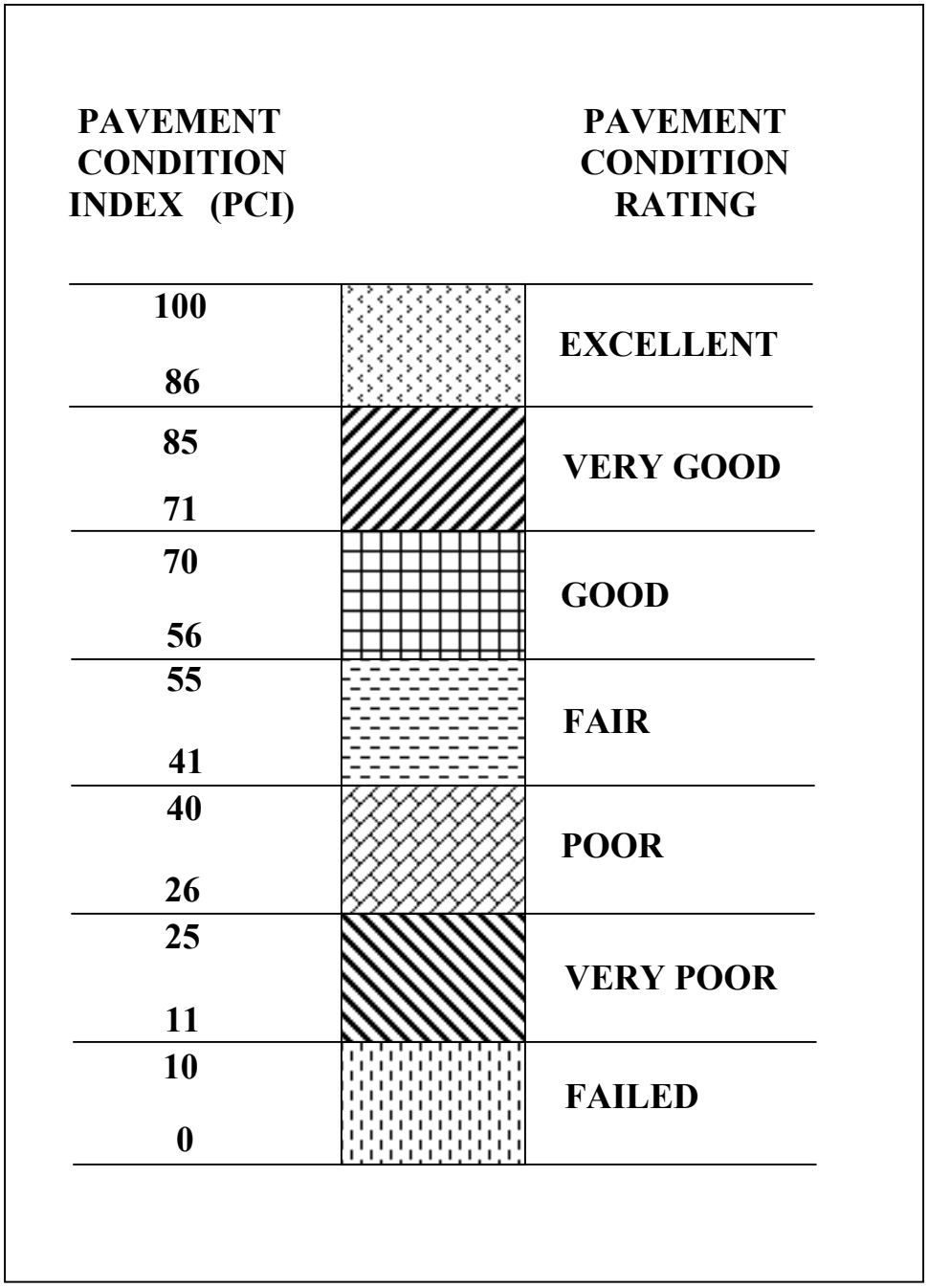

Figure C1. Scale for pavement condition rating

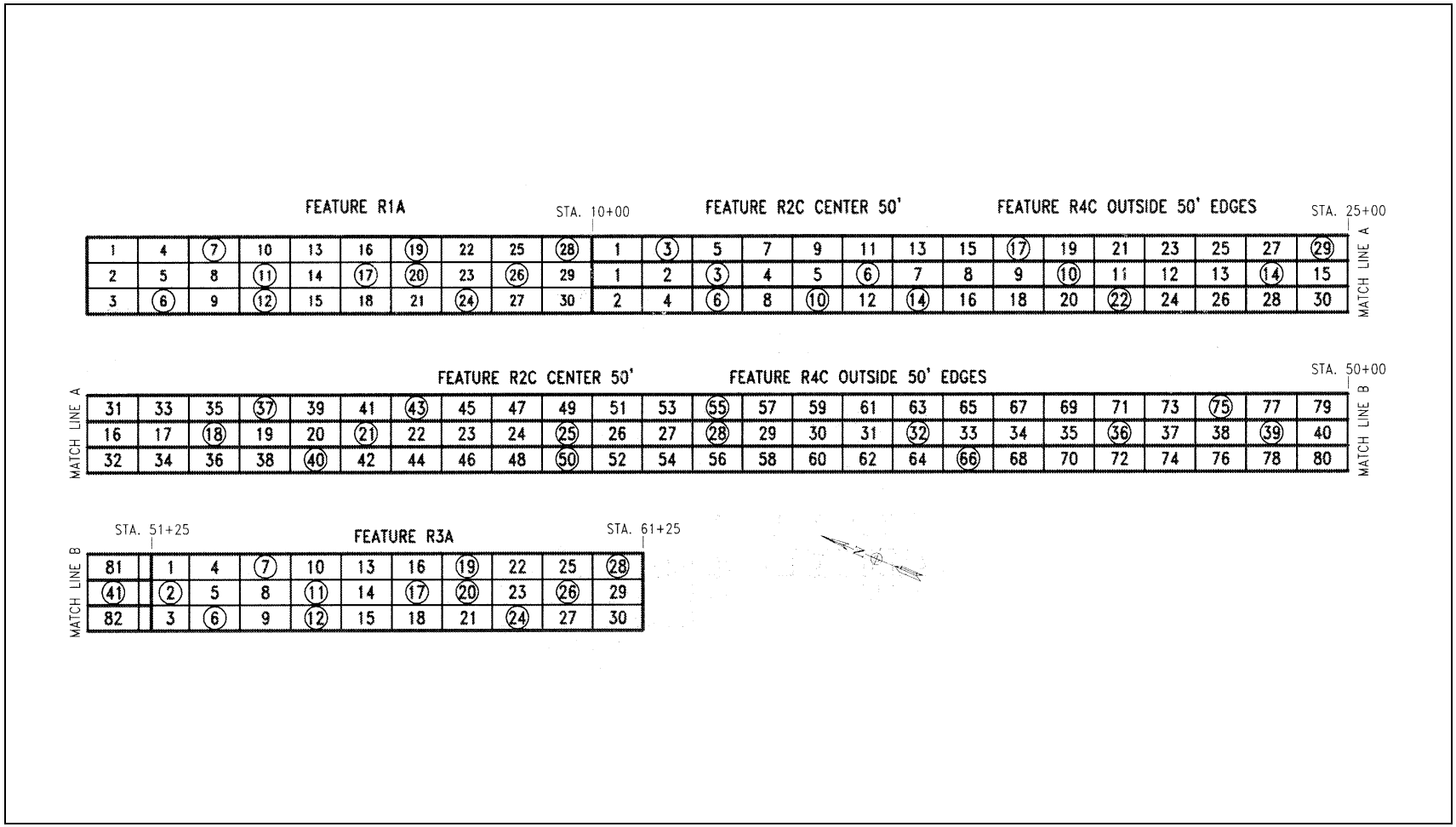

Figure C2. Sample unit layout, Runway 15-33, features R1A through R4C

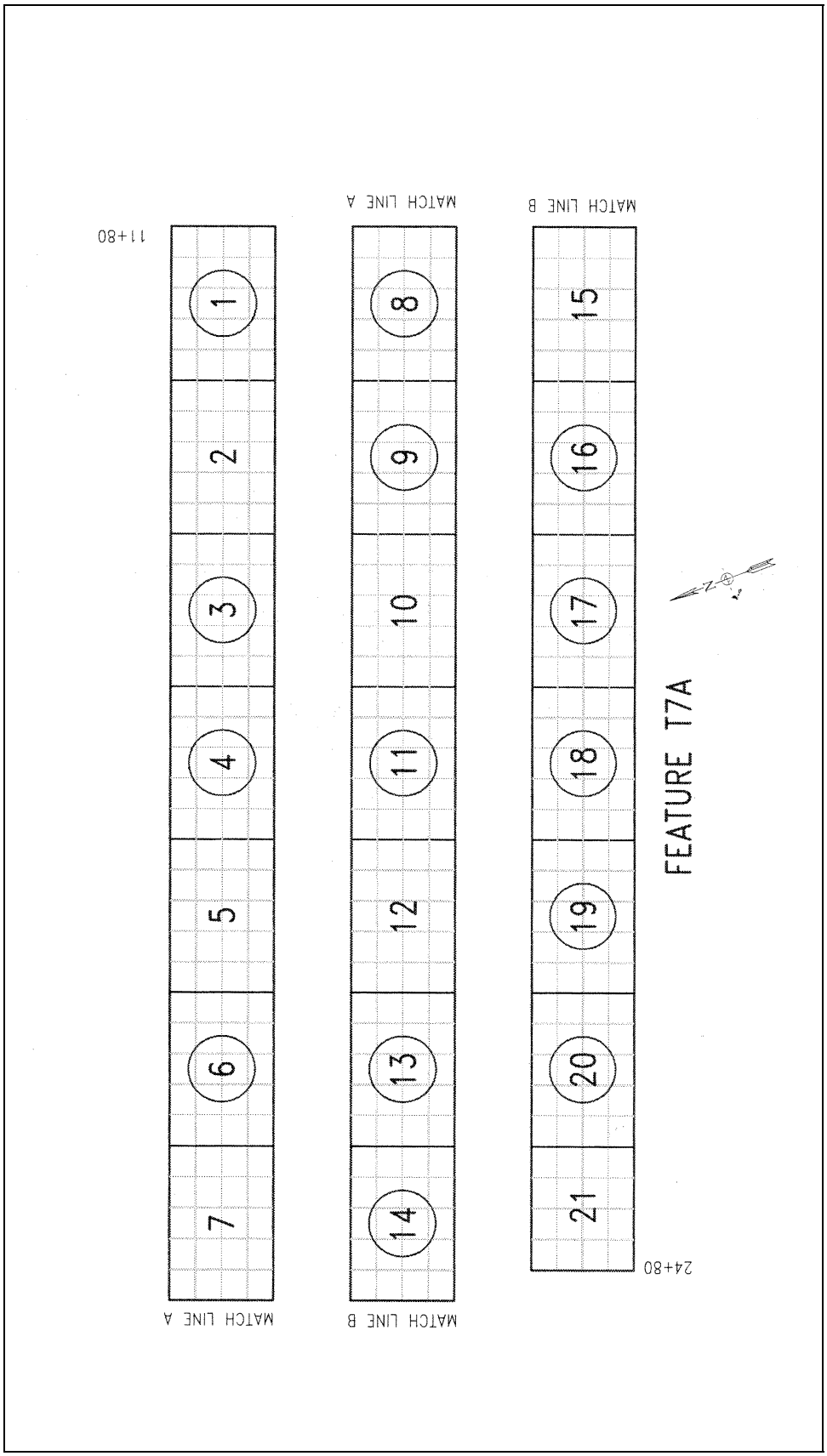

Figure C3. Sample unit layout, Taxiway G, feature T7A

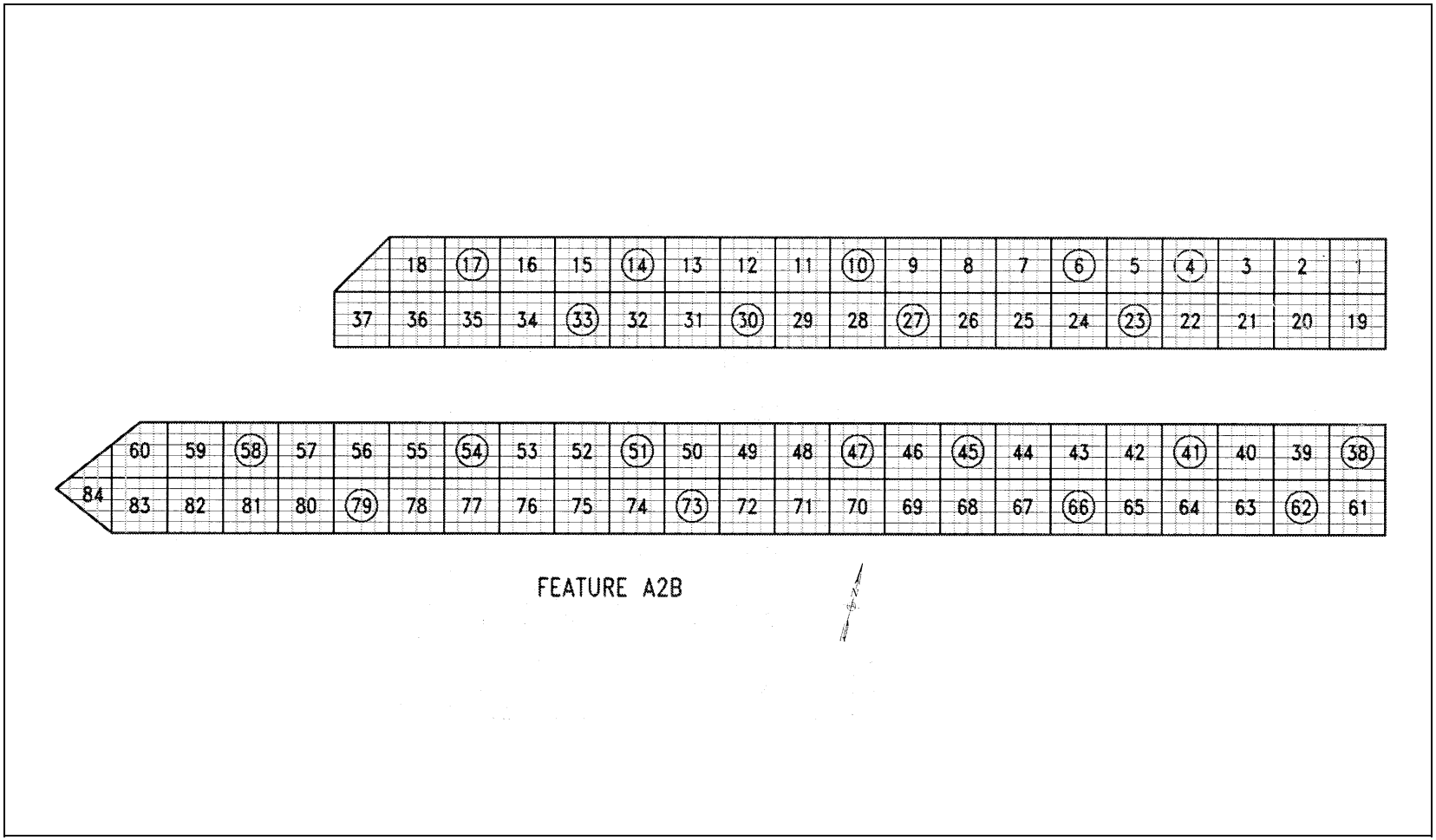

Figure C4. Sample unit layout, West Ramp, feature A2B

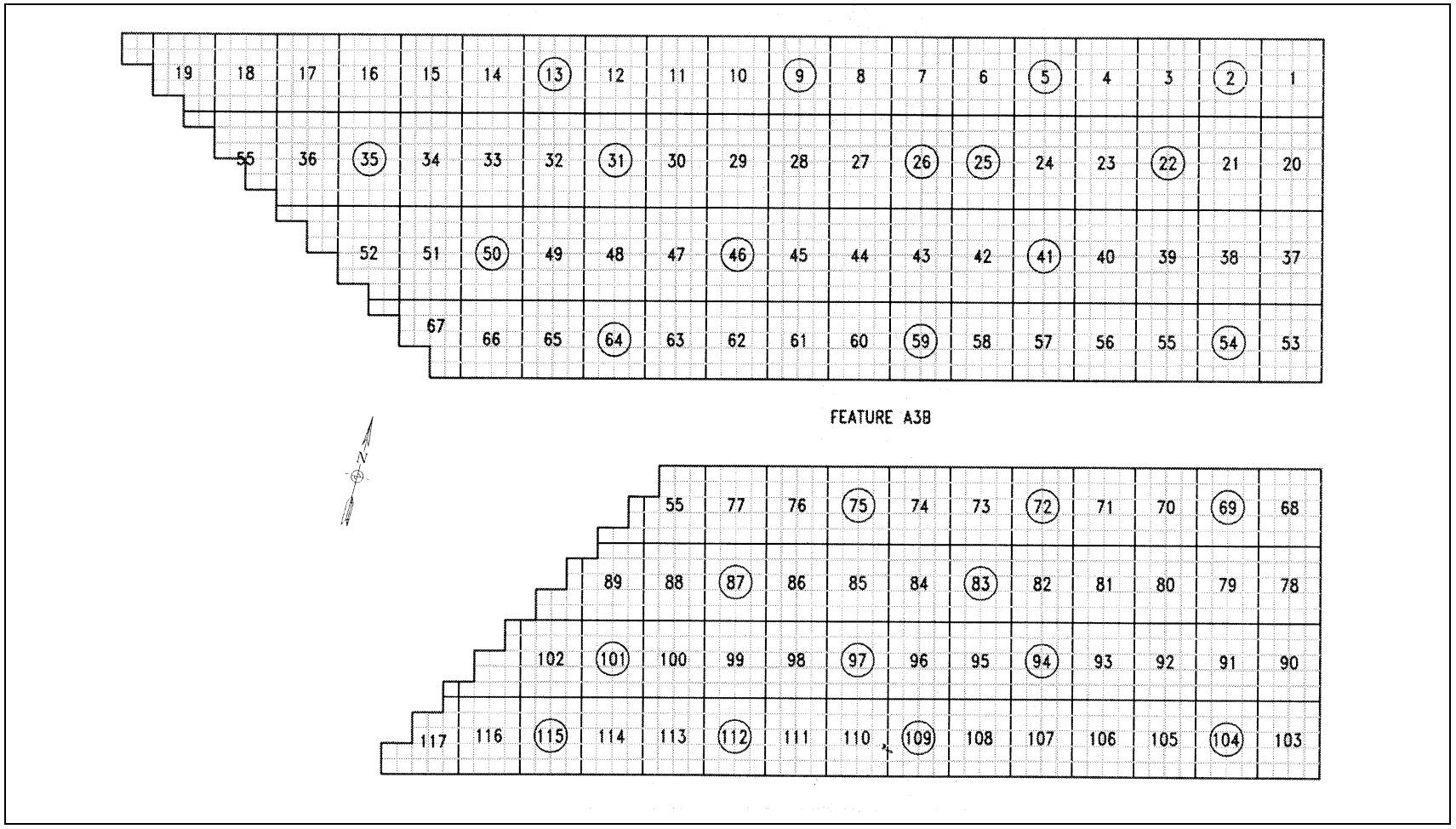

Figure C5. Sample unit layout, West Ramp, feature A3B

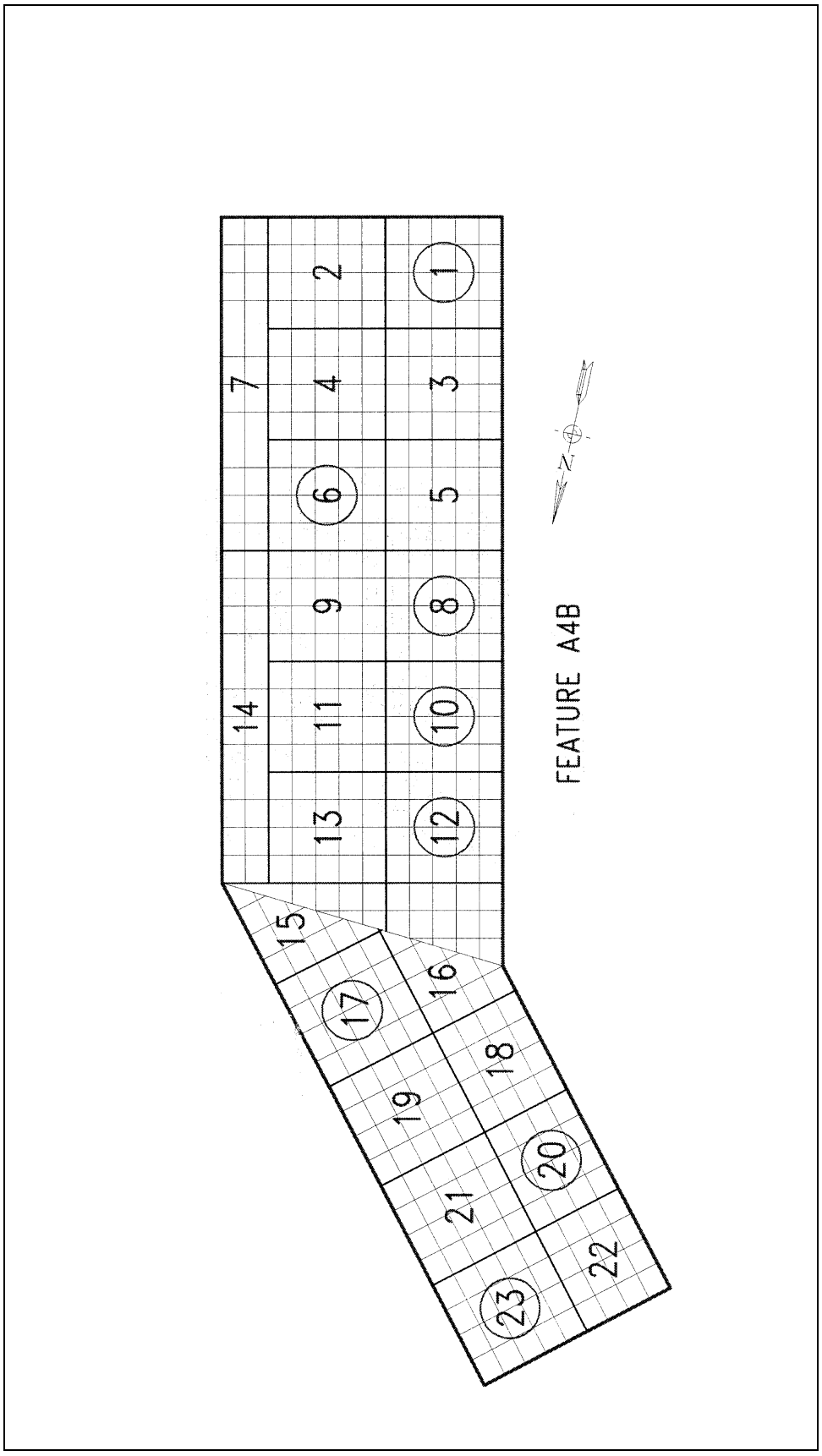

Figure C6. Sample unit layout, Hot Spot, feature A4B

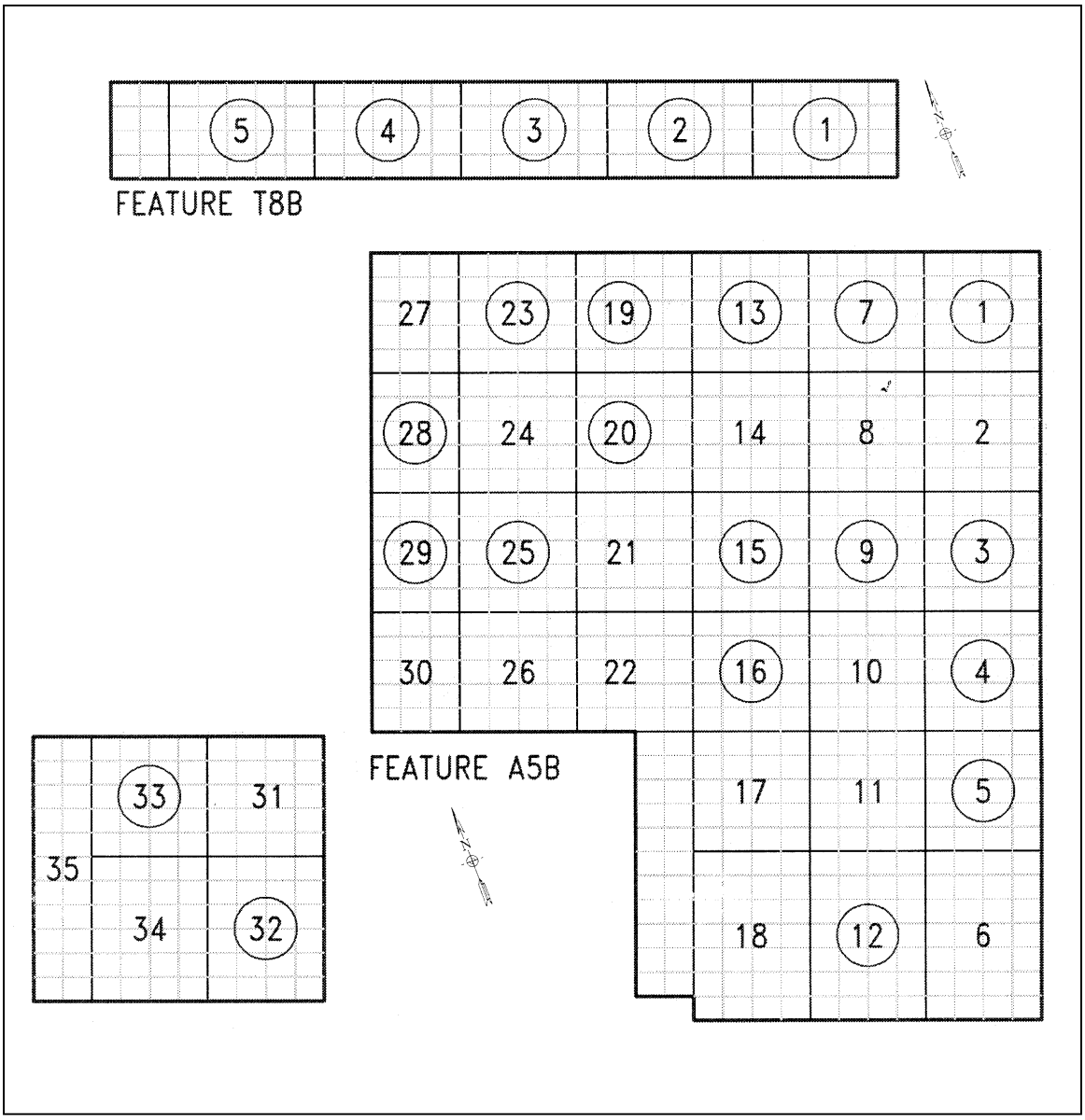

Figure C7. Sample unit layout, Taxiway G and Hangar 3075 Access Apron, features T8B and A5B, respectively

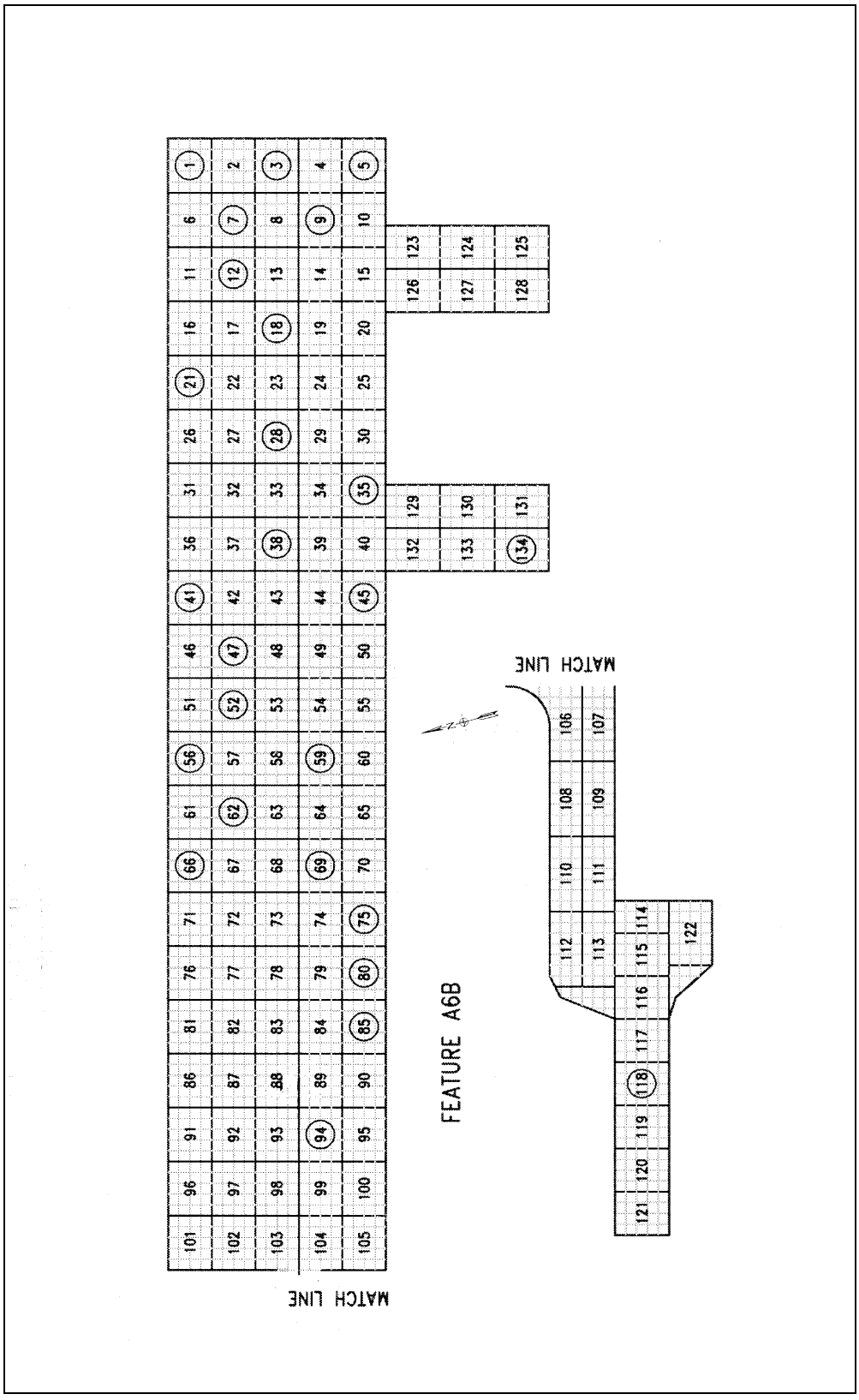

Figure C8. Sample unit layout, Parking Apron, feature A6B

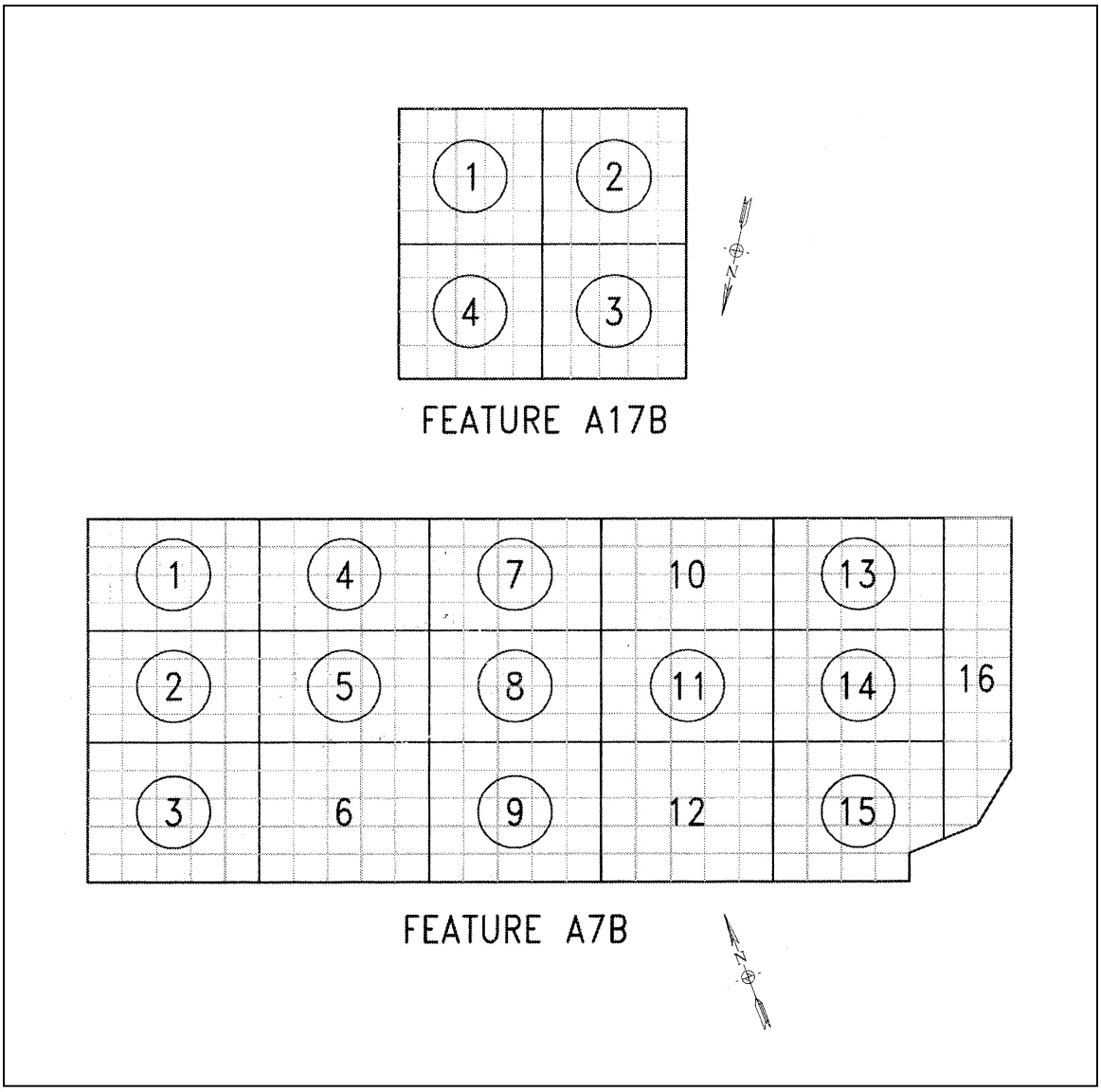

Figure C9. Sample unit layout, Parking Apron and Compass Rose, features A7B and A17B

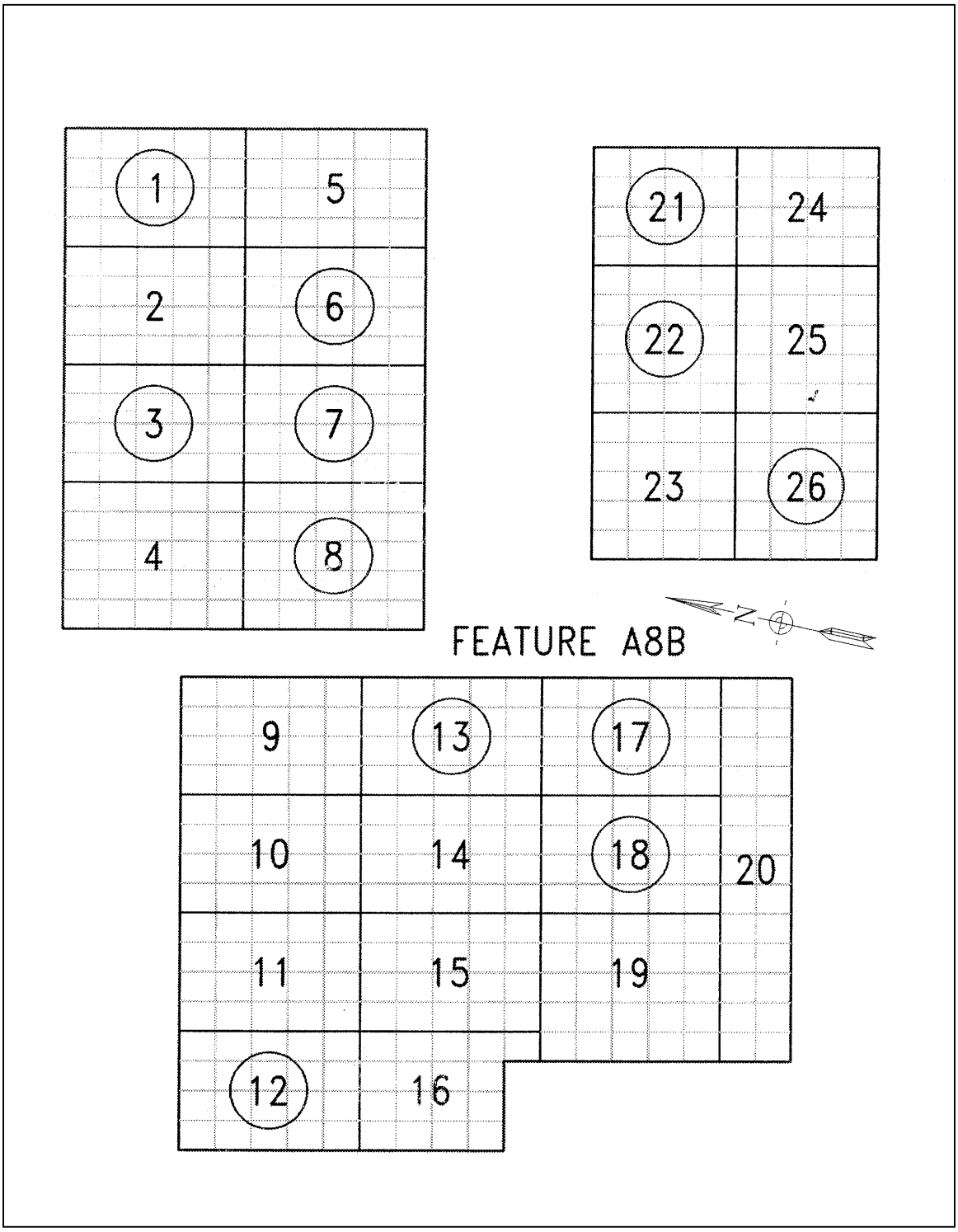

Figure C10. Sample unit layout, Hangars 3036 & 3041 Access Apron, feature A8B

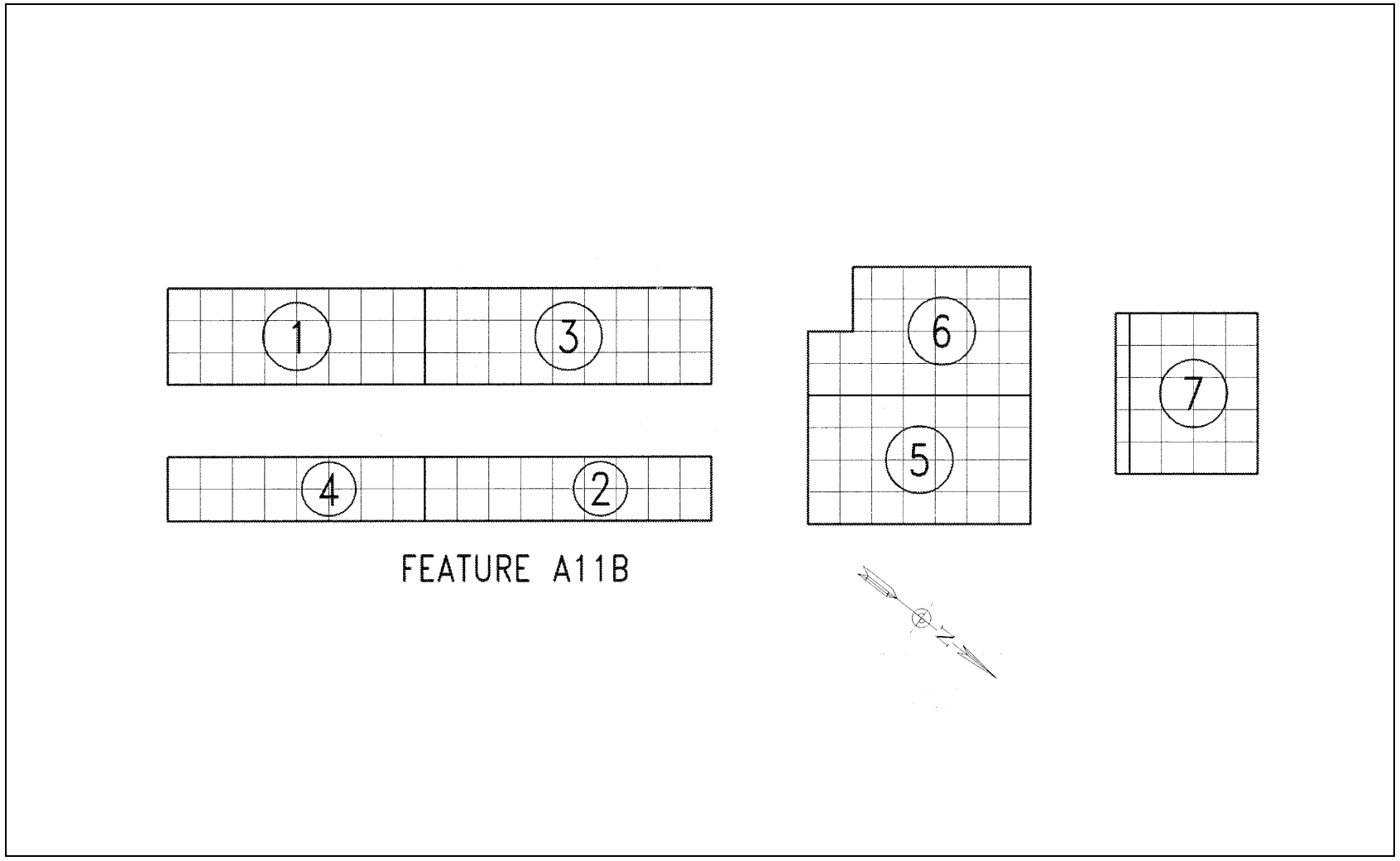

Figure C11. Sample unit layout, OLR Ramp, feature A11B

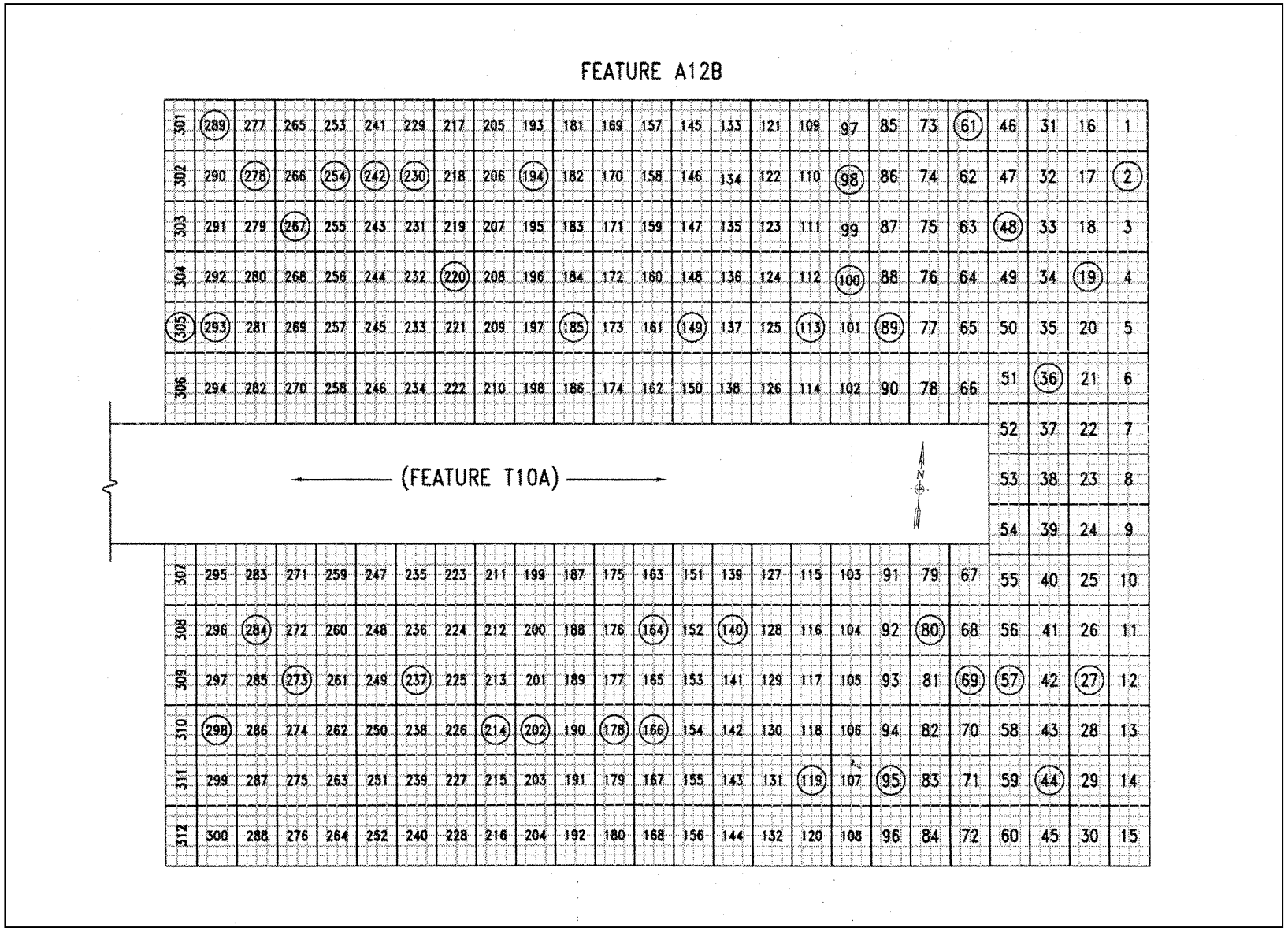

Figure C12. Sample unit layout, Northeast Ramp, feature A12B

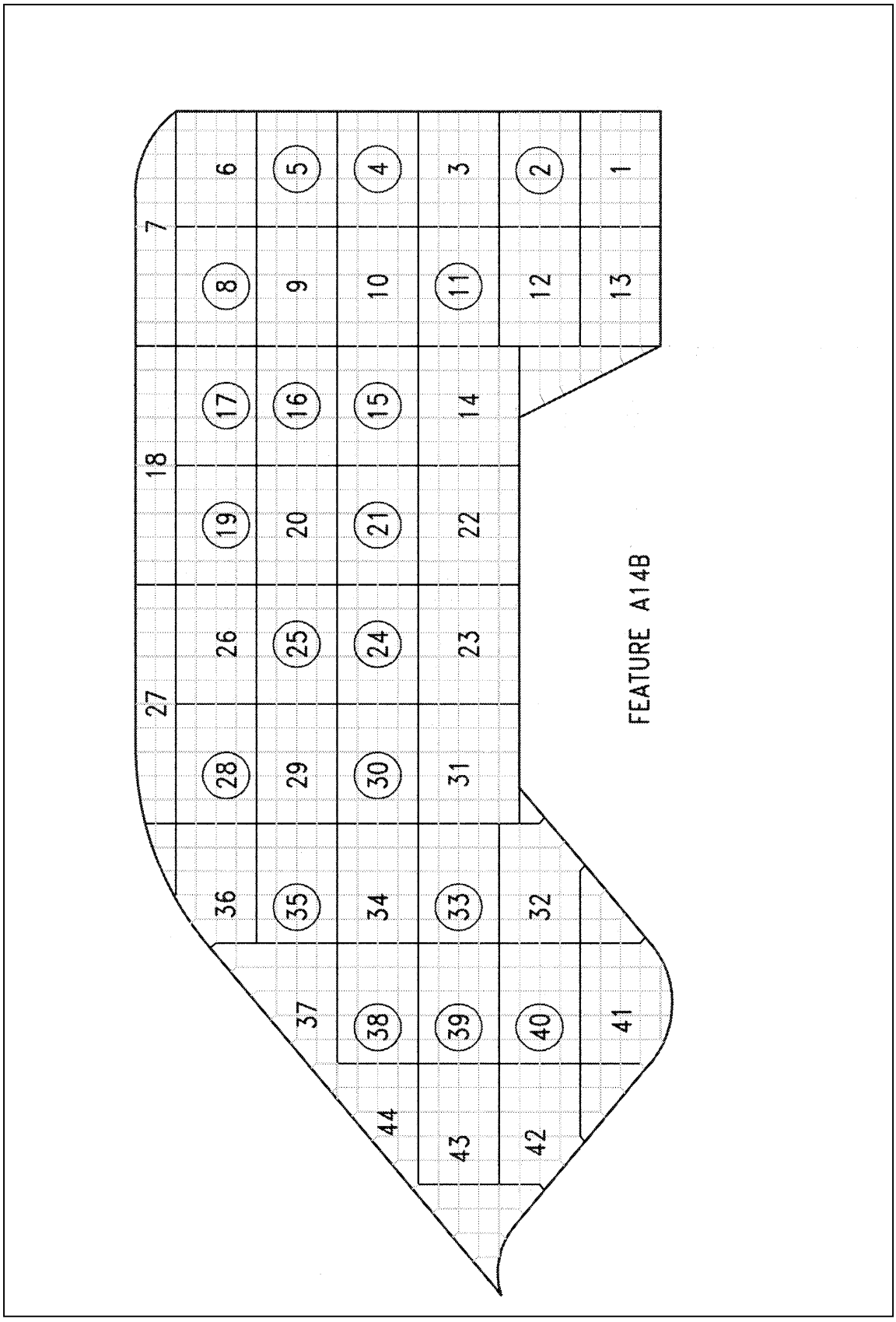

Figure C13. Sample unit layout, East Ramp, feature A14B

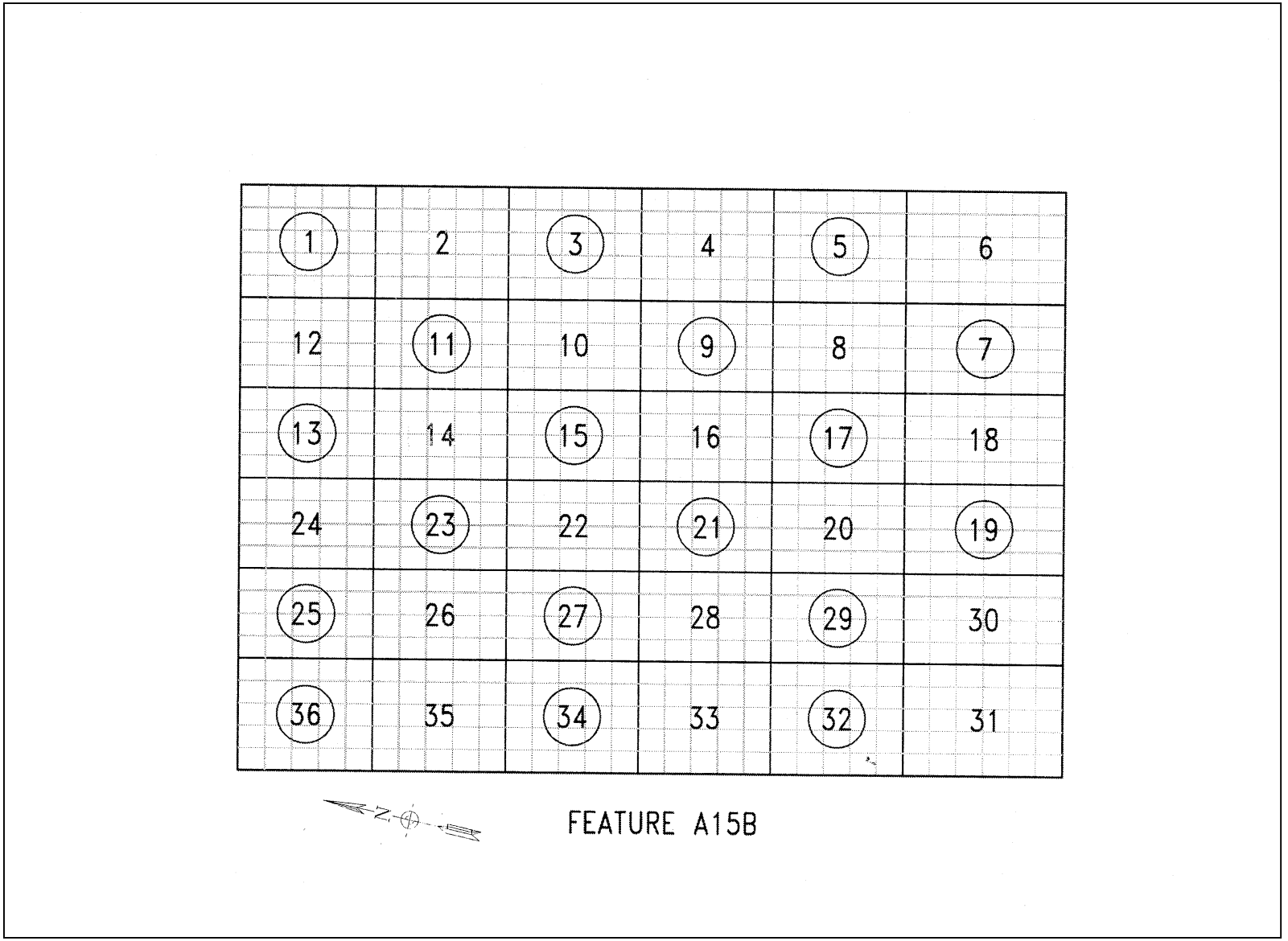

Figure C14. Sample unit layout, Southeast Ramp, feature A15B

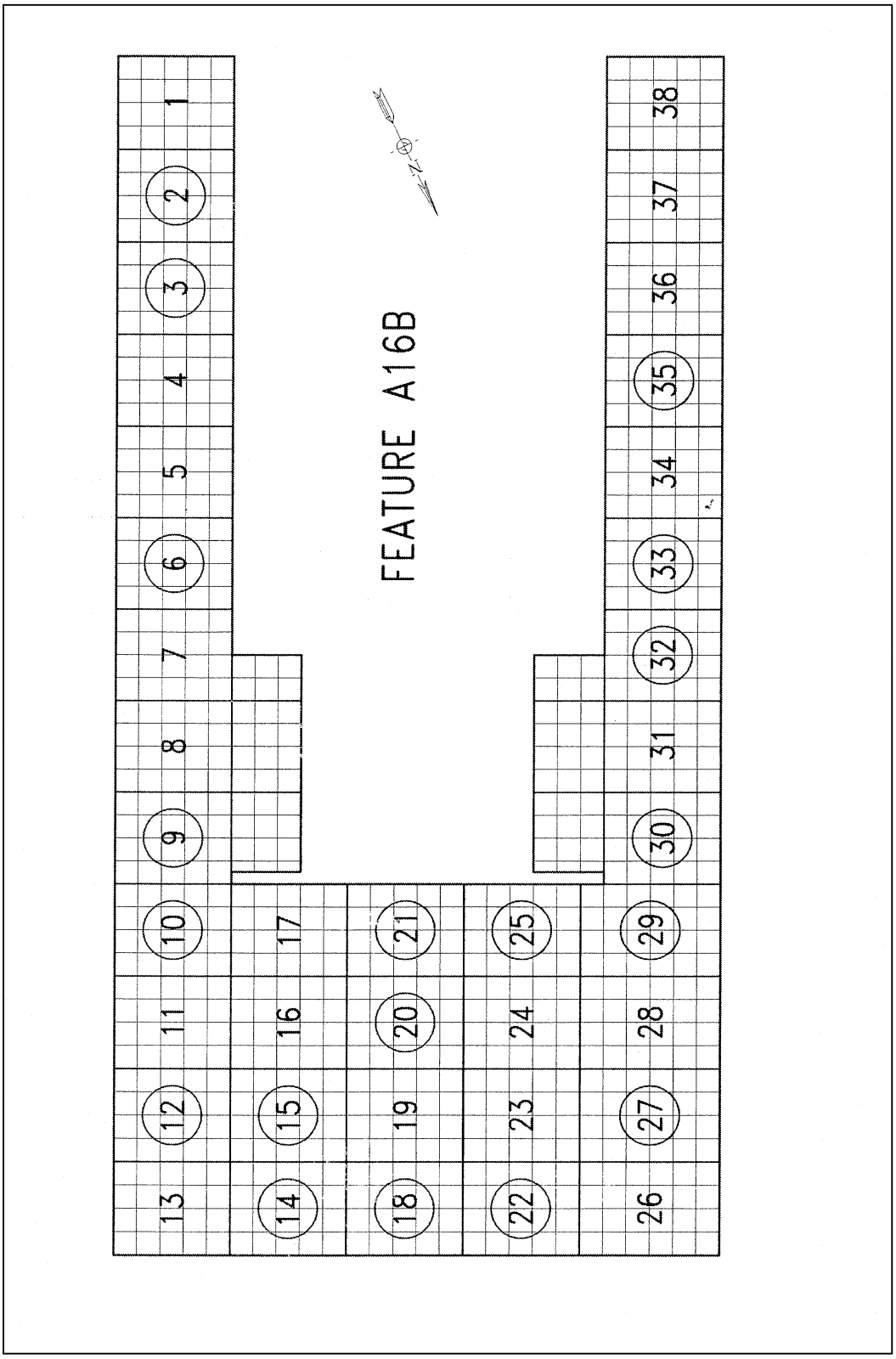

Figure C15. Sample unit layout, Hangar 3025 Apron, feature A16B

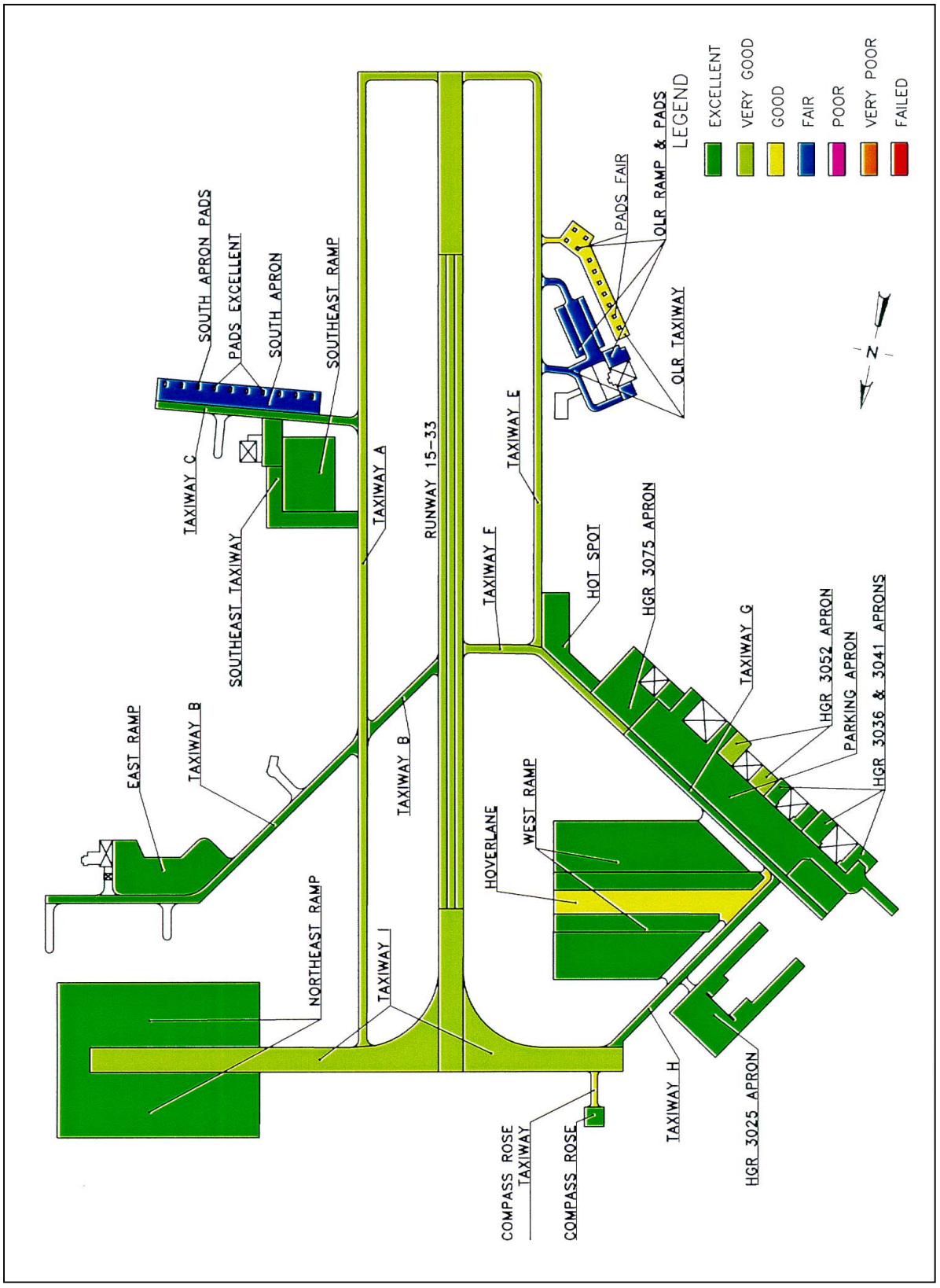

Figure C16. Pavement condition rating summary

Table C1
Comparison of 1991, 1996, and 2001 PCI Surveys

Feature	1989 PCI	1994 PCI	2001 PCI	2001 Rating	Change in PCI From 1994 to 2001 (+ or -)	Pavement Type
Runways						
R1A	90	85	79	Very good	-6	AC
R2C	86	81	73	Very good	-9	AC
R3A	86	83	71	Very good	-12	AC
R4C	--[1]	--[1]	72	Very good	--	AC
Taxiways						
T1A	88	88	74	Very good	-12	AC
T2C	92	87	90	Excellent	+3	AC
T3B	90	59	92	Excellent	+33	AC
T4B	84	95	96	Excellent	+1	AC
T5A	86	90	77	Very good	-13	AC
T6A	89	93	84	Very good	-9	AC
T7A	93	95	91	Excellent	-4	PCC
T8B	97	98	93	Excellent	-5	PCC
T9A	89	90	89	Excellent	-1	AC
T10A	89	89	79	Very good	-10	AC
T11B	79	72	48	Fair	-24	AC
T12B	94	89	62	Good	-27	AC
T13B	94	98	86	Excellent	-12	AC
T14B	100	99	96	Excellent	-3	AC
T15B	100	89	63	Good	-26	AC
Aprons and Ramps						
A1B	81	74	63	Good	-11	AC
A2B	99	99	94	Excellent	-5	PCC
A3B	100	94	97	Excellent	+3	PCC
A4B	98	99	91	Excellent	-8	PCC
A5B	98	97	90	Excellent	-7	PCC
A6B	95	95	92	Excellent	-3	PCC
A7B	99	98	99	Excellent	+1	PCC
A8B	86	99	98	Excellent	-1	PCC
A9B	--[2]	84	78	Very good	-6	AC
A10B	81	58	42	Fair	-16	AC
A11B	51	52	42	Fair	-10	PCC
A12B	98	96	97	Excellent	+1	PCC
A13B	73	86	88	Excellent	+2	PCC

(Continued)

[1] Not surveyed prior to 2001.
[2] Not surveyed prior to 1994

Table C1 (Concluded)

Feature	1989 PCI	1994 PCI	2001 PCI	2001 Rating	Change in PCI From 1994 to 2001 (+ or -)	Pavement Type
Aprons and Ramps (Continued)						
A14B	98	96	97	Excellent	+1	PCC
A15B	98	92	93	Excellent	+1	PCC
A16B	97	97	92	Excellent	-5	PCC
A17B	97	98	91	Excellent	-7	PCC
A18B	66	61	51	Fair	-10	PCC

[3] Not surveyed prior to 1996.
[4] Not surveyed in 2001.

Photo C1. Runway 15-33, low-severity patching

Photo C2. Runway 15-33, medium-severity patching

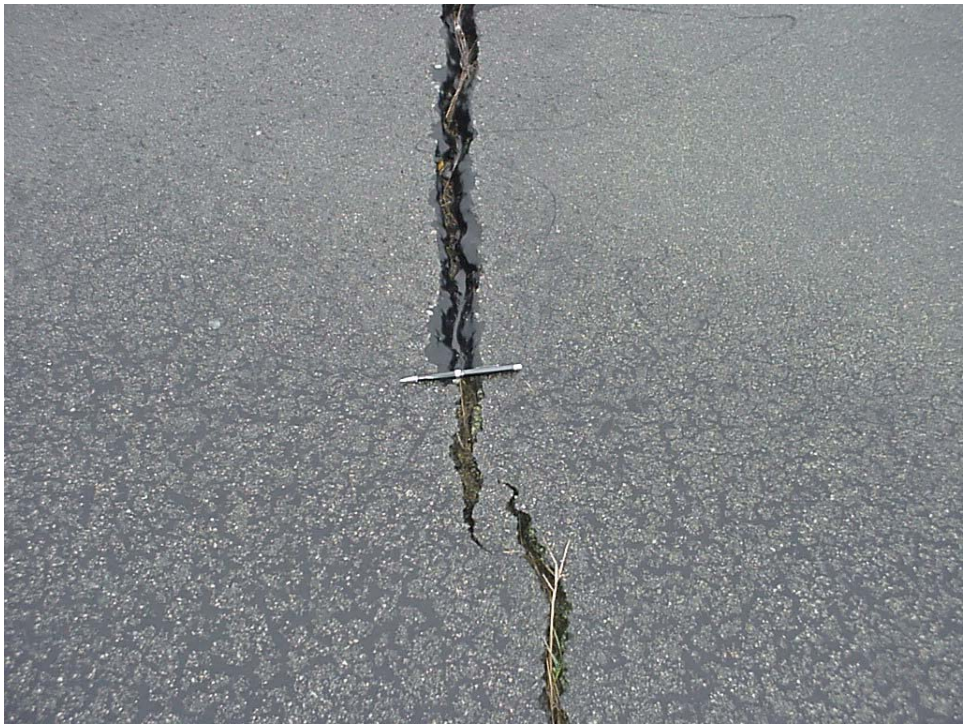

Photo C3. Taxiway E, Feature T5A, high-severity longitudinal cracking

Photo C4. Taxiway E, Feature T5A, low-severity alligator cracking

Photo C5. Taxiway I, T10A, low-severity longitudinal cracking

Photo C6. OLR Taxiway, Feature T12B, high-severity longitudinal cracking

Photo C7. Hoverlane, Feature A1B, medium-severity alligator cracking

Photo C8. South Apron, Feature A10B, vegetation in the high-severity cracks

Photo C9. East Ramp, Feature A14B, low-severity longitudinal cracking

Photo C10. OLR Parking Pads, Feature A18B, low-severity shattered slabs

Appendix D
Structural Analyses

General

The performance of the airfield pavement facilities was analyzed for either the mixture of traffic shown in Table A4 or for specific aircraft traffic based on usage.

The mixture of aircraft traffic listed in Table A4 was converted to equivalent traffic of the critical aircraft based on the procedure outlined in TM 5-825-2/ DM 21.3/AFM 88-6, Chapter 2 (Headquarters, Departments of the Army, the Air Force, and the Navy 1978). The critical aircraft is defined as that aircraft within a mixture of various aircraft operating at a facility that will impose a more severe combination of gear load and tire pressure than the other assigned aircraft at their respective pass levels. For the projected aircraft traffic mixture, the critical aircraft within the mixture was determined and the number of passes of the critical aircraft required to produce an effect on the pavement equivalent to the total mixture of traffic was computed. The current Corps of Engineers (CE) design criteria is utilized to analyze and equate the various aircraft loadings. PCC and AC pavements have different design criteria and, thus, a different number of equivalent operations of the design aircraft. The critical aircraft operating on the PCC and AC primary fixed-wing pavements was determined to be the C-17 aircraft. The evaluation of all rotary-wing pavements was based on the CH-47 aircraft. Table D1 presents the critical aircraft computation results for the airfield.

The operational ACN values determined for the critical aircraft (263 Mg (580-kip) C-17 aircraft) are shown in Table D2 for the four subgrade strength categories.

In a wartime scenario, aircraft may be required to operate at weights that exceed normal peacetime loads. These aircraft would have a higher ACN, would cause more damage, and reduce the life of the pavement. A mobilization ACN can be determined from the appropriate ACN-PCN curve presented in ETL 1110-3-394 (Headquarters, Department of the Army 1991). Typical ACN-PCN curves for the C-17 aircraft is shown in Figure D1. For contingency planning, it is often necessary to determine the largest aircraft that can safely land on an airfield.

Runway length is a critical factor in this determination. Minimum take-off distances for maximum take-off weights of aircraft are also given in ETL 1110-3-394 (Headquarters, Department of the Army 1991). For a specified aircraft, the ACN can be determined from the ACN-PCN curve and then the effect of the higher loads on the airfield can be determined from the ACN/PCN ratio. Specific aircraft mobilization traffic requirements are contained in classified mobilization plans and are not included in this report.

ACN-PCN Method of Reporting Pavement Structural Condition

The ACN-PCN method is structured so that the structural evaluation of a pavement for a particular aircraft can be accomplished by using the ratio of the aircraft ACN to the pavement PCN. For a given pavement life and a given number of operations of a particular aircraft, there is a relationship between the ACN/PCN ratio and the percent of pavement life used by the applied traffic. For a given ACN/PCN ratio, a relationship exists for the number of operations that will produce failure of the pavement. These relationships provide a method for evaluating a pavement for allowable load depending on an acceptable degree of damage to the pavement or an allowable number of operations of a particular aircraft to cause failure of a pavement. For aircraft having an ACN equal to the PCN, the predicted failure of the pavement would equal the design life of the pavement. Aircraft having ACN's higher than the pavement PCN would overload the pavement and decrease the life of the pavement. Likewise if the ACN of the operational aircraft were less than the pavement PCN, the life of the pavement would be greater than the design life. If the operational ACN is greater than the pavement PCN and a decrease in pavement life is not acceptable, then structural improvement of the pavement is required to bring the pavement PCN up to or greater than the operational ACN.

PCN Analysis

Modulus values shown in Appendix B were input into the computerized Layered Elastic Evaluation Program (LEEP) to determine the load-carrying capacity of each pavement feature in accordance with UFC 3-260-03 (Headquarters, Departments of the Army, Navy, and the Air Force 2001). Using the design aircraft and traffic levels for normal operations, a PCN was determined for each pavement feature. The PCN is determined using the allowable gross aircraft load and the subgrade strength category. To determine the subgrade category, back-calculated subgrade moduli were converted to CBR values using the correlation $E = 1500 (CBR)$. Table D3 presents a summary of the evaluation of each pavement feature in terms of allowable gross aircraft loadings, PCN, and overlay thicknesses required to increase the structural capacity such that the mission traffic can be supported (PCN $\geq$ operational ACN). The Airfield Pavement Evaluation Chart (APEC) presented in Illustration 1 shows a layout of the airfield pavements and corresponding PCN for each facility.

The PCN codes and PCI for each feature were analyzed to establish ISR ratings listed in Table 3-1. An ISR Rating for each pavement facility is shown in Illustration 2. AR 420-72 (Headquarters Department of the Army 2000) requires that the following ACN/PCN ratios be used in determining ISR ratings for airfield pavement facilities.

ACN/PCN ≤ 1.0 equals an ISR Green rating
1.0 < ACN/PCN ≤ 1.5 equals an ISR Amber rating
ACN/PCN > 1.5 equals an ISR Red rating

For those features having a PCN< the required operational ACN, the additional pavement thickness (overlay) needed to support the mission traffic was computed. Although the required increase in pavement strength is presented as an overlay thickness, several other approaches could be considered. A detailed analysis will be required to select and design the most cost-effective repair or improvement alternative. It should be noted that although less than 102 mm (4-in.) -thick AC overlay requirements are indicated in Table D3, the following minimum thicknesses are recommended in UFC 3-260-2 (Headquarters, Departments of the Army, Navy, and the Air Force 2001):

a. 51 mm (2-in.) -thick minimum AC overlay over AC pavements.

b. 102 mm (4-in.) -thick minimum AC overlay over PCC pavements.

c. 152 mm (6-in.) -thick minimum PCC partially or nonbonded overlay.

d. 51 mm (2-in.) -thick minimum PCC fully bonded overlay over PCC pavements.

These minimum overlay requirements are required to control the degree of cracking which will occur in the base pavement (existing pavement) due to the application of the design traffic. If those features needing structural improvements are not upgraded in a timely manner pavement may deteriorate rapidly and result in damage to all pavement layers and an increase in cost for the necessary improvements. Excessive damage may also result in lengthy closures of the pavement facility.

The PCN codes for the weakest feature within each pavement facility are shown in Table D4. The PCN code includes the PCN numerical value, pavement type, subgrade category, allowable tire pressure, and method used to determine the PCN. An example of a PCN code is: 30/F/A/W/T, with 30 expressing the numerical PCN value, F indicating a flexible pavement, A indicating high strength subgrade, W indicating high-allowable tire pressure, and T indicating that the PCN value was obtained by a technical evaluation. Table D5 presents a description of the letter codes comprising the PCN code. Each PCN assumes that only the design aircraft will be used for the stated number of passes. Theoretically, if the PCN is equal to the ACN, the pavement should perform satisfactorily and require only routine maintenance through the length of the analysis period. There may be situations when it is necessary to overload a pavement, i.e., the ACN is greater than the PCN. Examples are emergency landings, short-term

contingencies, exercises, and air shows. Pavements can usually support some overload; however, pavement life can be reduced. If the PCN were less than the ACN, the ACN/PCN ratio would be greater than 1 and the pavement would be expected to fail before reaching the end of the analysis period. As a general rule, ACN/PCN ratios of up to 1.25 have minimal impact on pavement life. If the ACN/PCN ratio is between 1.25 and 1.50, aircraft operations should be limited to 10 passes and the pavement inspected after each operation. Aircraft operations resulting in an ACN/PCN ratio over 1.50 should not be allowed except for emergencies. An example of how to use the ACP/PCN method to determine if an aircraft will overload a pavement is shown below.

Example Problem

Runway 15-33, taxiway A, taxiways I and, the Northeast Ramp must be used for 1,000 passes of a C-17 aircraft operating at a take-off weight of 226 800 kg (500,000 lb). Find the weakest features on each facility and determine if they can support this traffic?

Solution

From Table D3, determine the PCN for the weakest feature on R/W 15-33, and for taxiways A and I, and for the Northeast Ramp; from Figure D1 determine the ACN of a 226 800 kg (550,000 lb) C-17, and then calculate the ACN/PCN ratio using the appropriate PCN from Table D3.

a. Runway 15-33.

Weakest feature is R1A (see Table D3)
PCN for R1A = 42/F/A/W/T
ACN for a 226 800 kg (500,000 lb) C-17 on a high strength subgrade = 42/F/A/W/T (see Figure D1).
ACN/PCN ratio is 42/42 or 1.0; therefore R/W 15-33 should perform satisfactorily.

b. Taxiway A (T1A).

PCN for T1A = 32/F/A/W/T
ACN for a C-17 on a high strength subgrade = 42/F/A/W/T (see Figure D1).
ACN/PCN ratio is 42/32 or 1.31; therefore aircraft operations on T1A should be limited to 10 passes and the pavement inspected after each operation

c. Taxiway I (T10A).

PCN for T10A = 37/F/A/W/T
ACN for a C-17 on a high strength subgrade = 42/F/A/W/T (see Figure D1).
ACN/PCN ratio is 42/37 or 1.14; therefore the overload on T10A will have minimal impact on the pavement life.

d. Northeast Ramp (A12B).

PCN for A12B = 36/R/B/W/T
ACN for a C-17 on a medium strength subgrade = 43/R/B/W/T (see Figure D1).
ACN/PCN ratio is 43/36 or 1.19; therefore the overload on A12B will have minimal impact on the pavement life.

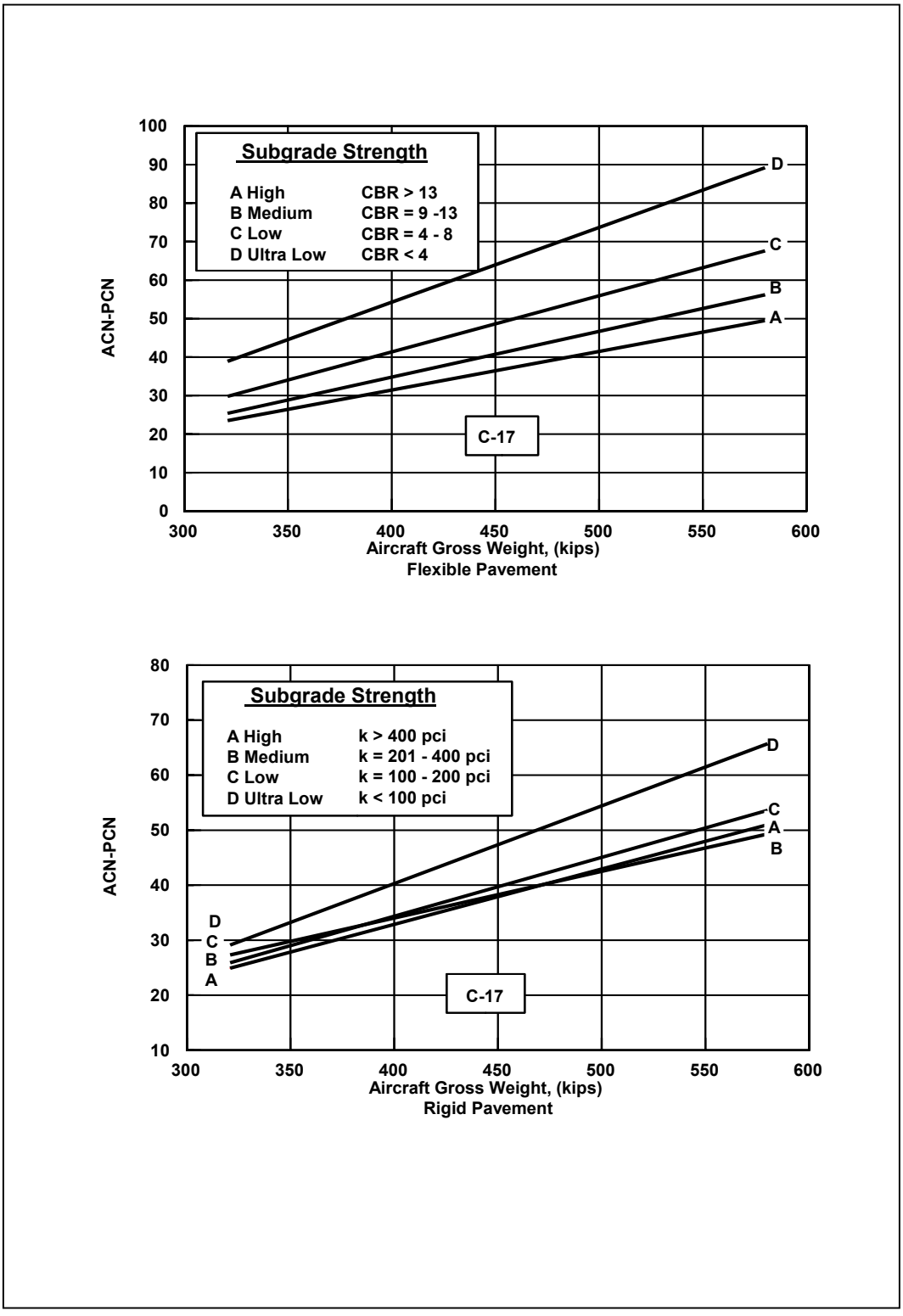

Figure D1. ACN-PCN curve for a C-17

Table D1
Determination of Critical Aircraft and Design Traffic

Primary Fixed-wing Pavements			
Fixed-Wing Pavements			
Fixed-Wing Aircraft	**Gross Weight kg (lb)**	**20-year Projected Aircraft Passes**	**20-year Equivalent C-17 Passes**
C-130	70 310 (155,000)	2,000	7
C-17	263 080 (580,000)	240	240
C-141	146 510 (323,000)	200	49
C-12J	7530 (16,600)	20,000	1
C-20	31 620 (69,700)	300	1
C-23	11 160 (24,600)	8,000	1
C-9	48 990 (108,000)	180	1
P-3C	61 240 (135,000)	40	2
FA-18F	29 940 (66,000)	60	1
B-737-400	68 040 (150,000)	20	1
20-year Total Equivalent C-17 passes @ 263 080 (580,000) = 304 (use 310)			
Rotary-Wing Pavements			
Fixed-Wing Aircraft	**Gross Weight kg (lb)**	**20-year Projected Aircraft Passes**	**20-year Equivalent C-17 Passes**
CH-47	22 680 (50,000)	48,000	48,000
OH-60	7390 (16,300)	10,800	475
OH-58	2280 (5,000)	300	1
20-year Total Equivalent CH-47 passes @ 22 680 (50,000) = 48,476 (use (48,500)			

Table D2
Determination of ACN Values for the Critical Aircraft

Fixed-Wing AC Pavements			
Design Aircraft	**Weight kg (lb)**	**Subgrade Category[1]**	**ACN or Required PCN**
C-17	263 080 (580,000)	A B C D	49 56 68 89
Fixed-Wing PCC Pavements			
Design Aircraft	**Weight kg (lb)**	**Subgrade Category[1]**	**ACN or Required PCN**
C-17	263 080 (580,000)	A B C D	50 46 54 66
Rotary-Wing AC Pavements			
Design Aircraft	**Weight kg (lb)**	**Subgrade Category[1]**	**ACN or Required PCN**
CH-47	22 700 (50,000)	A B C D	7 9 10 12
Rotary-Wing PCC Pavements			
Design Aircraft	**Weight kg (lb)**	**Subgrade Category[1]**	**ACN or Required PCN**
CH-47	22 700 (50,000)	A B C D	9 10 11 11

[1] See Table D5 for subgrade category.

Table D3
Allowable Gross Aircraft Loads and Overlay Requirements for the Projected Day-To-Day Traffic

Pavement Facility	Feature	Test Number or Station m (ft)	Type Traffic Area	Subgrade Strength[1] CBR, % or K, kPa/mm (psi/in.)	Design Aircraft[2]				Allowable Gross Load Mg (kips)	PCN	Theoretical Overlay Requirements, mm (in.)		
					Aircraft	Weight Kg (lb)	Passes	ACN			AC	PCC Partial Bond	PCC No Bond
Fixed-wing Pavements													
Runway 15-33	R1A	0+00-3+05 (0+00-10+00)	A	16	C-17	263 320 (580,000)	1,000	49/F/A/W/T	193 (425)	34/F/A/W/T	48 (1.9)	NA	--[4]
	R2C	3+05-15+62 (10+00-51+25)	C	24	C-17	263 320 (580,000)	1,000	49/F/A/W/T	263 (580+)[3]	64/F/A/W/T	0 (0.0)	NA	--[4]
	R3A	15+62-18+67 (51+25-61+25)	A	18	C-17	263 320 (580,000)	1,000	49/F/A/W/T	210 (456)	37/F/A/W/T	38 (1.5)	NA	--[4]
Taxiway A	T1A	0+00-18+90 (0+00-62+00)	A	18	C-17	263 320 (580,000)	1,000	49/F/A/W/T	189 (417)	33/F/A/W/T	74 (2.4)	NA	--[4]
Taxiway B	T2C	0+00-1+95 (0+00-6+40)	C	19	C-17	263 320 (580,000)	1,000	49/F/A/W/T	263 (580)	49/F/A/W/T	0 (0.0)	NA	--[4]
	T3B	2+10-8+92 (6+90-29+25)	B	23	C-17	263 320 (580,000)	1,000	49/F/A/W/T	230 (508)	42/F/A/W/T	25 (1.0)	NA	--[4]
Taxiway C	T4B	0+00-3+81 (0+00-12+50)	B	25	C-17	263 320 (580,000)	1,000	49/F/A/W/T	247 (544)	46/F/A/W/T	13 (0.5)	NA	--[4]
Taxiway E	T5A	0+00-12+19 (0+00-40+00)	A	15	C-17	263 320 (580,000)	1,000	49/F/A/W/T	128 (283)	20/F/A/W/T	135 (5.3)	NA	--[4]
Taxiway F	T6A	0+00-3+60 (0+00-11+80)	A	11	C-17	263 320 (580,000)	1,000	56/F/B/W/T	134 (295)	22/F/B/W/T	127 (5.0)	NA	--[4]
Taxiway G	T7A	0+00-3+96 (0+00-13+00)	A	60 (220)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	148 (326)	28/R/B/W/T	NA	155 (6.1)	201 (7.9)
	T8B	3+96-5+20 (13+00-17+05)	B	79 (295)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	174 (384)	33/R/B/W/T	NA	122 (4.8)	165 (6.5)
Taxiway H	T9A	0+00-4+27 (0+00-14+00)	A	19	C-17	263 320 (580,000)	1,000	49/F/A/W/T	197 (434)	35/F/A/W/T	53 (2.1)	NA	--[4]
Taxiway I	T10A	0+00-9+75 (0+00-32+00)	A	20	C-17	263 320 (580,000)	1,000	49/F/A/W/T	205 (453)	37/F/A/W/T	48 (1.9)	NA	--[4]
OLR Taxiway	T11B	0+00-4+11 (0+00-13+50)	B	21	CH-47	22 680 (50,000)	48,500	7/F/A/W/T	23 (50+)[3]	10/F/A/W/T	0 (0.0)	NA	--[4]
	T12B	0+00-2+29 (0+00-7+50)	B	17	CH-47	22 680 (50,000)	48,500	7/F/A/W/T	23 (50+)[3]	7/F/A/W/T	0 (0.0)	NA	--[4]
Southeast Taxiway	T13B	0+00-0+91 (0+00-3+00)	B	24	C-17	263 320 (580,000)	1,000	49/F/A/W/T	221 (488)	40/F/A/W/T	18 (0.7)	NA	--[4]

(Sheet 1 of 3)

[1] Values based on correlations between CBR and/or k and the backcalculated subgrade modulus.
[2] Determined for the critical aircraft (see Table D1).
[3] The allowable gross load is greater than the maximum take-off weight of the critical aircraft.
[4] Was not calculated because feature was evaluated as a flexible pavement.

Table D3 (Continued)

Pavement Facility	Feature	Test Number or Station m (ft)	Type Traffic Area	Subgrade Strength[1] CBR, % or K, kPa/mm (psi/in.)	Design Aircraft[2]				Allowable Gross Load Mg (kips)	PCN	Theoretical Overlay Requirements, mm (in.)		
					Aircraft	Weight Kg (lb)	Passes	ACN			AC	PCC Partial Bond	PCC No Bond
Fixed-wing Pavements													
Southeast Taxiway	T14B	0+91-3+47 (3+00-11+40)	B	20	C-17	263 320 (580,000)	1,000	49/F/A/W/T	164 (361)	28/F/A/W/T	97 (3.8)	NA	--[4]
Compass Rose Taxiway	T15B	0+00-0+61 (0+00-2+00)	B	27	C-17	263 320 (580,000)	1,000	49/F/A/W/T	205 (451)	37/F/A/W/T	56 (2.2)	NA	--[4]
Hoverlane	A1B	1-12	B	17	C-17	263 320 (580,000)	1,000	49/F/A/W/T	138 (304)	22/F/A/W/T	124 (4.9)	NA	--[4]
West Ramp	A2B	1-30	B	76 (281)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	171 (376)	32/R/B/W/T	NA	127 (5.0)	170 (6.7)
	A3B	1-40	B	58 (212)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	137 (303)	26/R/B/W/T	NA	175 (6.9)	221 (8.7)
Hot Spot	A4B	1-7	B	95 (351)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	252 (555)	47/R/B/W/T	NA	28 (1.1)	58 (2.3)
HGR 3075 Access Apron	A5B	1-7	B	61 (225)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	155 (341)	29/R/B/W/T	NA	145 (5.7)	191 (7.5)
Parking Apron	A6B	1-19	B	58 (214)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	151 (333)	28/R/B/W/T	NA	150 (5.9)	196 (7.7)
	A7B	1-4	B	75 (275)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	169 (372)	32/R/B/W/T	NA	127 (5.0)	173 (6.8)
HGRS 3036 & 3041 Access Apron	A8B	1-8	B	57 (209)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	150 (330)	28/R/B/W/T	NA	150 (5.9)	196 (7.7)
HGR 3052 Access Apron	A9B	1-4	B	15	C-17	263 320 (580,000)	1,000	49/F/A/W/T	135 (298)	21/F/A/W/T	122 (4.8)	NA	--[4]
South Apron	A10B	0-10	B	21	C-17	263 320 (580,000)	1,000	49/F/A/W/T	147 (323)	24/F/A/W/T	104 (4.1)	NA	--[4]
OLR Ramp	A11B	0-13	B	63 (232)	CH-47	22 680 (50,000)	48,500	10/R/B/W/T	23 (50+)[3]	13/R/B/W/T	NA	0 (0.0)	0 (0.0)
Northeast Ramp	A12B	1-31	B	99 (365)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	212 (467)	40/R/B/W/T	NA	84 (3.3)	124 (4.9)
South Apron Pads	A13B	1-5	B	56 (207)	CH-47	22 680 (50,000)	48,500	10/R/B/W/T	23 (50+)[3]	12/R/B/W/T	NA	0 (0.0)	0 (0.0)
East Ramp	A14B	1-6	B	61 (226)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	166 (366)	31/R/B/W/T	NA	142 (5.6)	188 (7.4)

[1] Values based on correlations between CBR and/or k and the backcalculated subgrade modulus.
[2] Determined for the critical aircraft (see Table D1).
[3] The allowable gross load is greater than the maximum take-off weight of the critical aircraft.
[4] Was not calculated because feature was evaluated as a flexible pavement.

Table D3 (Concluded)

Pavement Facility	Feature	Test Number or Station m (ft)	Type Traffic Area	Subgrade Strength[1] CBR, % or K, kPa/mm (psi/in.)	Design Aircraft[2]				Allowable Gross Load Mg (kips)	PCN	Theoretical Overlay Requirements, mm (in.)		
					Aircraft	Weight Kg (lb)	Passes	ACN			AC	PCC Partial Bond	PCC No Bond
Fixed-wing Pavements													
Southeast Ramp	A15B	1-10	B	73 (268)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	160 (353)	30/R/B/W/T	NA	142 (5.6)	185 (7.3)
HGR 3025 Apron	A16B	1-17	B	76 (279)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	161 (356)	30/R/B/W/T	NA	140 (5.5)	185 (7.3)
Compass Rose	A17B	1-3	B	74 (272)	C-17	263 320 (580,000)	1,000	49/R/B/W/T	168 (370)	32/R/B/W/T	NA	130 (5.1)	175 (6.9)
OLR Parking Pads	A18B	1-5	B	57 (210)	CH-47	22 680 (50,000)	48,500	10/R/B/W/T	23 (50+)[3]	10/R/B/W/T	NA	0 (0.0)	0 (0.0)

(Sheet 3 of 3)

[1] Values based on correlations between CBR and/or k and the backcalculated subgrade modulus.
[2] Determined for the critical aircraft (see Table D1).
[3] The allowable gross load is greater than the maximum take-off weight of the critical aircraft.
[4] Was not calculated because feature was evaluated as a flexible pavement.

Table D4
Summary of Pavement Classification Numbers

Pavement Facility	Controlling Feature	PCN[1] Code
Fixed-Wing Pavements		
Runway 15-33	R1A	42/F/A/W/T
Taxiway A	T1A	32/F/A/W/T
Taxiway B	T2C	47/F/A/W/T
Taxiway E	T5A	24/F/A/W/T
Taxiway F	T6A	16/F/B/W/T
Taxiway G	T7A	24/R/B/W/T
Taxiway H	T9A	25/F/A/W/T
Taxiway I	T10A	37/F/A/W/T
Hot Spot	A4B	40/R/B/W/T
Hangar 3075 Access Apron	A5B	26/R/B/W/T
Parking Apron	A7B	27/R/B/W/T
Hangars 3036 & 3041 access Aprons	A8B	25/R/B/W/T
Hangar 3052 Access Apron	A9B	26/F/A/W/T
Northeast Ramp	A12B	36/R/B/W/T
Rotary-Wing Pavements		
Taxiway B	T3B	12/F/A/W/T
Taxiway C	T4B	13/F/A/W/T
OLR Taxiway	T12B	8/F/A/W/T
Southeast Taxiway	T13B	7/F/A/W/T
Compass Rose Taxiway	T15B	10/F/A/W/T
Hoverlane	A1B	6/F/A/W/T
West Ramp	A3B	9/R/B/W/T
South Apron	A10B	8/F/A/W/T
OLR Ramp	A11B	11/R/B/W/T
South Apron Pads	A13B	10/R/B/W/T
East Ramp	A14B	17/R/B/W/T
Southeast Ramp	A15B	11/R/B/W/T
Hangar 3025 Apron	A16B	11/R/B/W/T
Compass Rose	A17B	12/R/B/W/T
OLR Parking Pads	A18B	10/R/B/W/T

[1] Table D5 describes the components of the PCN code.

Table D5
PCN Five-Part Code

PCN	Pavement Type	Subgrade Strength[1]	Tire Pressure2	Method of PCN Determination
Numerical value	R - rigid	A	W	T - technical evaluation
	F - flexible	B	X	U - using aircraft
		C	Y	
		D	Z	

[1]Code	Category	Flexible Pavement CBR, %	Rigid Pavement K, kPa/mm, (psi/in.)
A	High	〈 13	〈 108 (400)
B	Medium	13 > CBR 〈 8	108 > K 〈 54 (400 > K 〈 200)
C	Low	8 > CBR 〈 4	54 > K 〈 27 (200 > K 〈 100)
D	Ultra-low	< 4	< 27 (< 100)

[2]Code	Category	Tire Pressure, MPa (psi)
W	High	No limit
X	Medium	1.0 - 1.5 (146 - 217)
Y	Low	0.51 - 1.0 (73 - 145)
Z	Ultra-low	0 - 0.5 (0 - 72)

Appendix E
Micro PAVER Output Summary

```
Network ID      - Gray
Branch Name     - RUNWAY 15-33              Section Length  -   1000.00 LF
Branch Number   - R1A                       Section Width   -    150.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 150000.00 SF
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  79                                RATING = VERY GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    30
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    11
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  6.3%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  48 L & T CR       LOW          2057.00 (LF)      1.37          5.79
  48 L & T CR       MEDIUM       1185.00 (LF)       .79         10.13
  50 PATCHING       LOW          6048.00 (SF)      4.03          8.70
  50 PATCHING       MEDIUM        899.00 (SF)       .60          8.27


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - RUNWAY 15-33              Section Length  -   4125.00 LF
Branch Number   - R2C                       Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 206250.00 SF

================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  73                                RATING = VERY GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    41
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    12
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  5.6%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  41 ALLIGATOR CR   LOW            34.00 (SF)       .10            7.00
  45 DEPRESSION     LOW            69.00 (SF)       .10             .30
  48 L & T CR       LOW          4201.00 (LF)      2.04            7.51
  48 L & T CR       MEDIUM       1168.00 (LF)       .57            8.76
  50 PATCHING       LOW         11744.00 (SF)      5.69           10.68
  50 PATCHING       MEDIUM       3503.00 (SF)      1.70           11.54


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  15.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  84.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   1.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - RUNWAY 15-33              Section Length  -   1000.00 LF
Branch Number   - R3A                       Section Width   -    150.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 150000.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  71                                RATING = VERY GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    30
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    11
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  10.85%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  41 ALLIGATOR CR   LOW           136.00 (SF)          .10          7.00
  48 L & T CR       LOW          1561.00 (LF)         1.04          5.03
  48 L & T CR       MEDIUM        491.00 (LF)         0.33          6.78
  48 L & T CR       HIGH           68.00 (LF)         0.10          7.50
  50 PATCHING       LOW          3460.00 (SF)         2.31          6.1
  50 PATCHING       MEDIUM       2536.00 (SF)         1.69         11.52
  50 PATCHING       HIGH         1171.00 (SF)          .78         18.03

      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  11.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  89.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - RUNWAY 15-33             Section Length  -   4125.00 LF
Branch Number   - R4C                      Section Width   -    100.00 LF
Section Number  - 1    Family - DEFAULT     Section Area   - 412500.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  72                                RATING = Very GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    80
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    14
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF   10 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  8.5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  48 L & T CR       LOW          5358.00 (LF)       1.3          5.62
  48 L & T CR       MEDIUM       3763.00 (LF)      0.91         10.79
  48 L & T CR       HIGH          659.00 (LF)      0.16          9.38
  50 PATCHING       LOW          9984.00 (SF)      2.42           6.3
  50 PATCHING       MEDIUM       3868.00 (SF)       .94          9.25
  50 PATCHING       HIGH          777.00 (SF)       .19         15.89


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - TAXIWAY B                 Section Length  -    6200.00 LF
Branch Number   - T1A                       Section Width   -      50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    -  310000.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  74                                RATING = VERY GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    62
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    12
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF   27 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 17.21%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  41 ALLIGATOR      LOW          1662.00 (SF)      .54          15.03
  48 L & T CR       LOW          1162.00 (LF)      .37           3.82
  48 L & T CR       MEDIUM       1859.00 (LF)     0.60           8.99
  48 L & T CR       HIGH          465.00 (LF)     0.16           9.14
  50 PATCHING       LOW          2756.00 (SF)      .89           3.31
  50 PATCHING       MEDIUM      10632.00 (SF)     3.43          16.11


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  27.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  73.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - TAXIWAY B                 Section Length  -    640.00 LF
Branch Number   - T2C                       Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    -  32000.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  90                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    5
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 7.3%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  48 L & T CR       LOW          259.00 (LF)       .90           4.74
  48 L & T CR       MEDIUM        80.00 (LF)       .28           6.24
  48 L & T CR       HIGH          11.00 (LF)       .10           7.50
  50 PATCHING       LOW          230.00 (SF)       .80           3.11

      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                 RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY   RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - TAXIWAY B                 Section Length  -   2235.00 LF
Branch Number   - T3B                       Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 111750.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  92                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    23
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    10
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  6.3%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE
  48 L & T CR       LOW         683.00 (LF)        .59           4.21
  48 L & T CR       MEDIUM       71.00 (LF)       0.10           4.00
  50 PATCHING       LOW        1875.00 (SF)       1.63           4.86


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - TAXIWAY C                 Section Length  -  1250.00 LF
Branch Number   - T4B                       Section Width   -    50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 62500.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  96                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    12
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    7
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  4.1%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  48 L & T CR       LOW          141.00 (LF)      .23            3.27
  50 PATCHING       LOW          535.00 (SF)      .86            3.24



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                 RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY   RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - TAXIWAY E                 Section Length  -   4000.00 LF
Branch Number   - T5A                       Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 200000.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  77                                RATING = VERY GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    40
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    12
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF   15 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 12.7%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  41 ALLIGATOR      LOW          266.00 (SF)       .13            7.27
  41 ALLIGATOR      MEDIUM       133.00 (SF)       .10           10.00
  41 ALLIGATOR      HIGH         233.00 (SF)       .12           17.59
  48 L & T CR       LOW         2032.00 (LF)      1.02            4.98
  48 L & T CR       MEDIUM       756.00 (LF)      0.38            7.29
  48 L & T CR       HIGH         543.00 (LF)      0.27           11.41
  50 PATCHING       LOW         5048.00 (SF)      2.52            6.47



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                 RELATED DISTRESSES =  54.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY   RELATED DISTRESSES =  46.00 PERCENT DEDUCT VALUES.
  OTHER                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - TAXIWAY F                  Section Length  -   1180.00 LF
Branch Number   - T6A                        Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT      Section Area    -  59000.00 SF
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :            Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  84                              RATING = VERY GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    11
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    6
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    7 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 12.1%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  48 L & T CR       LOW          521.00 (LF)        0.88         4.71
  48 L & T CR       MEDIUM       250.00 (LF)        0.42         7.69
  48 L & T CR       HIGH         108.00 (LF)        0.18         9.89
  50 PATCHING       LOW          589.00 (SF)        1.00         3.55
  50 PATCHING       HIGH          18.00 (SF)         .10        15.50


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - TAXIWAY G                    Slab Length     -     12.50 LF
Branch Number   - T7A                          Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT        Number of Slabs -      416
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  91                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    14
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    14
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  4.2%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  62 CORNER BREAK   LOW            3 (SLABS)        1.00          .70
  63 LINEAR CR      LOW            9 (SLABS)        2.14         2.25
  65 JT SEAL DAM    MEDIUM       416 (SLABS)      100.00         7.00
  66 SMALL PATCH    LOW           16 (SLABS)        3.93          .46


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  28.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  68.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   4.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - TAXIWAY G                    Slab Length     -     15.00 LF
Branch Number   - T8B                          Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT        Number of Slabs -      108
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  93                               RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    5
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  65 JT SEAL DAM    MEDIUM      108 (SLABS)       100.00         7.00



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - TAXIWAY H                  Section Length  -   1400.00 LF
Branch Number   - T9A                        Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT      Section Area    -  70000.00 SF
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  89                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    14
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    9
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 3.8%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  48 L & T CR       LOW          1686.00 (LF)      2.41          8.50
  48 L & T CR       HIGH           16.00 (LF)      0.10          4.00
  50 PATCHING       LOW           939.00 (SF)      1.34          4.28



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - TAXIWAY I                  Section Length  -   3200.00 LF
Branch Number   - T10A                       Section Width   -    150.00 LF
Section Number  - 1    Family - DEFAULT      Section Area    - 480000.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  79                                RATING = VERY GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    32
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    12
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    9 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  9.1%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  41 ALLIGATOR CR   LOW           719.00 (SF)      .15           7.55
  48 L & T CR       LOW         15812.00 (LF)     3.29          10.80
  48 L & T CR       HIGH         5268.00 (LF)     1.10          11.72
  50 PATCHING       LOW          1998.00 (SF)      .42           2.30


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  23.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  77.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - OLR TAXIWAY               Section Length  -   1350.00 LF
Branch Number   - T11B                      Section Width   -     50.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    -  67500.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  48                                RATING = FAIR

  TOTAL NUMBER OF SAMPLE UNITS =    13
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    8
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  2.9%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE


  48 L & T CR       LOW          405.00 (LF)       .60            4.22
  48 L & T CR       MEDIUM       784.00 (LF)      1.16           12.03
  48 L & T CR       HIGH        3608.00 (LF)      5.35           42.29
  50 PATCHING       LOW          421.00 (SF)       .62            2.73
  50 PATCHING       MEDIUM       169.00 (SF)       .25            7.38

      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - OLR TAXIWAY     Section Length  -    750.00 LF
Branch Number   - T12B                        Section Width   -     80.00 LF
Section Number  - 1    Family - DEFAULT      Section Area    -  60000.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  62                                RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    13
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     7
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  4.1%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  48 L & T CR       LOW           57.00 (LF)       .10           2.50
  48 L & T CR       MEDIUM      1028.00 (LF)      1.71          14.52
  48 L & T CR       HIGH        1884.00 (LF)      3.14          33.51


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                 RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY   RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - SOUTHEAST TAXIWAY          Section Length  -    300.00 LF
Branch Number   - T13B                       Section Width   -    100.00 LF
Section Number  - 1    Family - DEFAULT      Section Area    -  30000.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  86                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    3
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     3
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    3 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 12.1%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  45 DEPRESSION     LOW           60.00 (SF)       .20             .78
  48 L & T CR       LOW          230.00 (LF)       .77            4.50
  48 L & T CR       MEDIUM       100.00 (LF)       .33            6.84
  48 L & T CR       HIGH          90.00 (LF)       .30           11.84
  50 PATCHING       LOW           32.00 (SF)       .11            2.00


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                 RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY   RELATED DISTRESSES =  97.00 PERCENT DEDUCT VALUES.
  OTHER                RELATED DISTRESSES =   3.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - SOUTHEAST RAMP TAXIWAY    Section Length  -    840.00 LF
Branch Number   - T14B                      Section Width   -    100.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    -  84000.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  96                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    8
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    5
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  6.6%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  48 L & T CR       LOW           34.00 (LF)       .10           2.50
  48 L & T CR       MEDIUM       134.00 (LF)       .16           4.53
  48 L & T CR       HIGH          34.00 (LF)       .10           7.50


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - COMPASS ROSE TAXIWAY       Section Length  -    200.00 LF
Branch Number   - T15B                       Section Width   -     95.00 LF
Section Number  - 1    Family - DEFAULT      Section Area    -  19000.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2006
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  63                              RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    2
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    2
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    2 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 10%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  48 L & T CR       LOW          95.00 (LF)        .50           4.06
  48 L & T CR       MEDIUM       66.00 (LF)        .35           7.01
  48 L & T CR       HIGH        456.00 (LF)       2.40          29.60


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                 RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY   RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - HOVER LANE                Section Length  -   1200.00 LF
Branch Number   - A1B                       Section Width   -    150.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 180000.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  63                              RATING = GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    36
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    8
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF   17 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 14.3%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  41 ALLIGATOR CR   LOW          2567.00 (SF)      1.43          23.82
  41 ALLIGATOR CR   HIGH          135.00 (SF)       .10          16.00
  48 L & T CR       LOW         10256.00 (LF)      5.70          16.21
  48 L & T CR       MEDIUM       2972.00 (LF)      1.65          14.25
  48 L & T CR       HIGH         1664.00 (LF)       .92          18.90



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  45.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  55.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - WEST RAMP                  Slab Length     -     11.00 LF
Branch Number   - A2B                        Slab Width      -     14.00 LF
Section Number  - 1    Family - DEFAULT      Number of Slabs -     1630
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: JUN/26/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  94                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    84
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    20
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  2.2%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  65 JT SEAL DAM    MEDIUM       408 (SLABS)      25.00          2.00
  65 JT SEAL DAM    MEDIUM      1223 (SLABS)      75.00          7.00
  66 SMALL PATCH    LOW           24 (SLABS)       1.50           .38
  74 JOINT SPALL    LOW            8 (SLABS)       1.00           .60
  75 CORNER SPALL   LOW            8 (SLABS)       1.00           .30


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  88.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =  12.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - WEST RAMP                  Slab Length     -     15.00 LF
Branch Number   - A3B                       Slab Width      -     15.00 LF
Section Number  - 1    Family - DEFAULT      Number of Slabs -      2470
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  97                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    117
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    27
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  5.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE


  63 LINEAR CR     LOW           52 (SLABS)       2.10         2.21
  65 JT SEAL DAM   MEDIUM       518 (SLABS)      20.98         7.00
  73 SHRINKAGE CR  LOW            9 (SLABS)       1.00          .60
  74 JOINT SPALL   LOW            4 (SLABS)       1.00          .60


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  21.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  67.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =  12.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - HOT SPOT                    Slab Length     -     12.50 LF
Branch Number   - A4B                        Slab Width      -     15.00 LF
Section Number  - 1    Family - DEFAULT      Number of Slabs -      456
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  91                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    23
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =     8
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  3.4%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  65 JT SEAL DAM    MEDIUM       456 (SLABS)      100.00         7.00
  66 SMALL PATCH    LOW           40 (SLABS)        8.75          .93
  67 LARGE PATCH    LOW            6 (SLABS)        1.25         1.16


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  77.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  23.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - HANGAR 3075 ACCESS         Slab Length     -     15.00 LF
Branch Number   - A5B                        Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT      Number of Slabs -      736
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  90                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    35
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    18
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 2.8%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  63 LINEAR CR      LOW            8 (SLABS)        1.13         1.22
  65 JT SEAL DAM    MEDIUM       694 (SLABS)       94.35         7.00
  66 SMALL PATCH    LOW           27 (SLABS)        3.67         0.45
  66 SMALL PATCH    MEDIUM        15 (SLABS)        1.98         1.11
  67 LARGE PATCH    LOW            4 (SLABS)        1.00          .75
  74 JOINT SPALL    LOW            4 (SLABS)        1.00          .60



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  11.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  63.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  26.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - PARKING APRON              Slab Length     -     12.50 LF
Branch Number   - A6B                        Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT      Number of Slabs -     2696
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  92                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    135
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    26
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  6.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  63 LINEAR CR      LOW          114 (SLABS)       4.23         4.10
  63 LINEAR CR      MEDIUM         5 (SLABS)       1.00         1.00
  64 DURABIL. CR    LOW            5 (SLABS)       1.00          .50
  65 JT SEAL DAM    LOW         2592 (SLABS)      96.15         2.00
  65 JT SEAL DAM    MEDIUM       104 (SLABS)       3.85         7.00
  66 SMALL PATCH    LOW           78 (SLABS)       2.88          .44
  66 SMALL PATCH    MEDIUM         5 (SLABS)       1.00          .60
  67 LARGE PATCH    LOW           47 (SLABS)       1.73         1.55
  70 SCALING        LOW           10 (SLABS)       1.00          .50
  74 JOINT SPALL    LOW           10 (SLABS)       1.00          .60
  75 CORNER SPALL   LOW            5 (SLABS)       1.00          .30
  75 CORNER SPALL   MEDIUM         5 (SLABS)       1.00          .80


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  26.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  49.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  25.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - PARKING APRON              Slab Length     -     15.00 LF
Branch Number   - A7B                        Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT      Number of Slabs -      345
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  99                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    16
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    14
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  .9%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE


  65 JT SEAL DAM    LOW          251 (SLABS)       72.88         2.0




      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
 Network ID   - Gray
Branch Name  - HANGAR APRONS 3036 & 3041     Slab Length     -     15.00 LF
Branch Number   - A8B                       Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT      Number of Slabs -     530
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  98                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    26
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    12
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = .5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  65 JT SEAL DAM    LOW          530 (SLABS)      100.00         2.00
  75 CORNER SPALL   LOW            2 (SLABS)        1.00         0.30



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  87.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  13.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - HANGAR 3052 APRON          Section Length  -    185.00 LF
Branch Number   - A9B                        Section Width   -    110.00 LF
Section Number  - 1    Family - DEFAULT      Section Area    -  20350.00 SF
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  78                                RATING = VERY GOOD

  TOTAL NUMBER OF SAMPLE UNITS =    4
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    3
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    4 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 12.5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  43 BLOCK CR       LOW          6770 (SF)        33.30          25.01
  48 L & T CR       LOW           340 (LF)         1.67           6.54
  48 L & T CR       MEDIUM        120 (LF)         0.59           8.92


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - SOUTH APRON               Section Length  -   1000.00 LF
Branch Number   - A10B                      Section Width   -    140.00 LF
Section Number  - 1    Family - DEFAULT     Section Area    - 140000.00 SF
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  42                                RATING = FAIR

  TOTAL NUMBER OF SAMPLE UNITS =    27
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    10
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF   21 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  26.7%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  41 ALLIGATOR CR   LOW            271 (SF)          .20          8.59
  41 ALLIGATOR CR   MEDIUM        1083 (SF)          .80         27.04
  43 BLOCK CR       MEDIUM       20304 (SF)        14.98         26.76
  43 BLOCK CR       HIGH         67679 (SF)        49.95         65.35
  48 L & T CR       LOW           1354 (LF)         1.00          4.94
  48 L & T CR       MEDIUM         975 (LF)         0.72          9.72
  48 L & T CR       HIGH            27 (LF)         0.10          7.50

      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  24.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  76.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - OLR RAMP                  Slab Length     -     20.00 LF
Branch Number   - A11B                      Slab Width      -     20.00 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     156
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  42                              RATING = FAIR

  TOTAL NUMBER OF SAMPLE UNITS =    7
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    4
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  9.7%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  63 LINEAR CR      LOW           76 (SLABS)       48.86        20.25
  63 LINEAR CR      MEDIUM         7 (SLABS)        4.55        10.86
  65 JT SEAL DAM    LOW           43 (SLABS)       27.27         2.00
  65 JT SEAL DAM    MEDIUM       113 (SLABS)       72.73         7.00
  66 SMALL PATCH    LOW            2 (SLABS)        1.14          .25
  67 LARGE PATCH    LOW            4 (SLABS)        2.27         1.81
  67 LARGE PATCH    MEDIUM         2 (SLABS)        1.14         3.16
  72 SHAT. SLAB     LOW           60 (SLABS)       38.64        37.02
  75 CORNER SPALL   LOW            2 (SLABS)        1.14         0.44


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =  82.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  11.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =   7.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - NORTHEAST RAMP            Slab Length     -     12.50 LF
Branch Number   - A12B                      Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     6528
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  97                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =   312
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    38
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED = 1.5%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE

  66 DURABIL. CR    LOW            9 (SLABS)        1.00          .50
  65 JT SEAL DAM    LOW         6184 (SLABS)       94.74         2.00
  67 LARGE PATCH    LOW           26 (SLABS)        1.00          .75
  74 JOINT SPALL    LOW           26 (SLABS)        1.00          .60
  75 CORNER SPALL   LOW           43 (SLABS)        1.00         0.44


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  60.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  40.00 PERCENT DEDUCT VALUES
```

```
 Network ID      - Gray
Branch Name     - SOUTH APRON PADS          Slab Length     -     30.00 LF
Branch Number   - A13B                      Slab Width      -     15.00 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     10

================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  88                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    1
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    1
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    1 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =   15.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY      QUANTITY      DENSITY %    DEDUCT VALUE

  65 JT SEAL DAM    HIGH        10 (SLABS)       100.00         12.00



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - EAST RAMP                 Slab Length     -     15.00 LF
Branch Number   - A14B                     Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     879
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  97                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    44
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    19
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  3.9%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  62 CORNER BREAK   LOW           2 (SLABS)       1.00           .70
  63 LINEAR CR      LOW          19 (SLABS)       2.11          2.22
  74 JOINT SPALL    LOW           9 (SLABS)       1.05           .71
  75 CORNER SPALL   LOW           2 (SLABS)       1.00          0.30


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =  74.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =  26.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - SOUTHEAST RAMP            Slab Length     -     12.50 LF
Branch Number   - A15B                      Slab Width      -     15.00 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     806

================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  93                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    36
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    18
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  1.7%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  65 JT SEAL DAM    LOW          91 (SLABS)       11.31         2.00
  65 JT SEAL DAM    MEDIUM      707 (SLABS)       87.69         7.00
  74 JOINT SPALL    LOW           2 (SLABS)        1.00          .60


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES =    .00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =  94.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =   6.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - HANGAR 3025 APRON         Slab Length     -     15.00 LF
Branch Number   - A16B                       Slab Width      -     15.00 LF
Section Number  - 1    Family - DEFAULT     Number of Slabs -     830

================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  92                                RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    38
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    19
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =     0
  RECOMMENDED MINIMUM OF    5 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  2.6%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

  65 JT SEAL DAM    LOW          43 (SLABS)        5.15         2.00
  65 JT SEAL DAM    MEDIUM      787 (SLABS)       94.85         7.00
  67 LARGE PATCH    LOW           9 (SLABS)        1.03          .82
  74 JOINT SPALL    LOW          15 (SLABS)        1.80         1.43
  75 CORNER SPALL   LOW           6 (SLABS)        1.00          .30


      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                 RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY   RELATED DISTRESSES =  78.00 PERCENT DEDUCT VALUES.
  OTHER                RELATED DISTRESSES =  22.00 PERCENT DEDUCT VALUES.
```

```
 Network ID      - Gray
Branch Name     - COMPASS ROSE               Slab Length     -     15.00 LF
Branch Number   - A17B                       Slab Width      -     12.50 LF
Section Number  - 1    Family - DEFAULT      Number of Slabs -     80
================================================================================

  --------------------------------------------------------------------------
  Inspection Date: JUN/26/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:              F.O.D.:
  --------------------------------------------------------------------------

  PCI OF SECTION =  91                              RATING = EXCELLENT

  TOTAL NUMBER OF SAMPLE UNITS =    4
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    4
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    4 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  1.4%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY       DENSITY %   DEDUCT VALUE


  65 JT SEAL DAM   MEDIUM        80 (SLABS)      100.00         7.00
  74 JOINT SPALL   LOW            3 (SLABS)        3.75         1.88
  75 CORNER SPALL  LOW            1 (SLABS)        1.25         0.53



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY RELATED DISTRESSES =  74.00 PERCENT DEDUCT VALUES.
  OTHER              RELATED DISTRESSES =  26.00 PERCENT DEDUCT VALUES.
```

```
Network ID      - Gray
Branch Name     - OLR PARKING PADS          Slab Length     -     15.00 LF
Branch Number   - A18B                      Slab Width      -     15.00 LF
Section Number  - 1    Family - DEFAULT      Number of Slabs -     11
================================================================================

  ------------------------------------------------------------------------
  Inspection Date: 10/31/2001
  Riding Quality :             Safety:       Drainage Cond.:
  Shoulder Cond. :      Overall Cond.:               F.O.D.:
  ------------------------------------------------------------------------

  PCI OF SECTION =  51                              RATING = FAIR

  TOTAL NUMBER OF SAMPLE UNITS =    1
  NUMBER OF RANDOM SAMPLE UNITS SURVEYED     =    1
  NUMBER OF ADDITIONAL SAMPLE UNITS SURVEYED =    0
  RECOMMENDED MINIMUM OF    1 RANDOM SAMPLE UNITS TO BE SURVEYED.
  STANDARD DEVIATION OF PCI BETWEEN RANDOM UNITS SURVEYED =  15.0%


         *** EXTRAPOLATED DISTRESS QUANTITIES FOR SECTION ***

  DISTRESS-TYPE    SEVERITY       QUANTITY      DENSITY %    DEDUCT VALUE

   63 LINEAR CR      LOW          7 (SLABS)       63.64         21.62
   72 SHAT. SLAB     LOW          4 (SLABS)       36.36         35.92



      *** PERCENT OF DEDUCT VALUES BASED ON DISTRESS MECHANISM ***

  LOAD                RELATED DISTRESSES = 100.00 PERCENT DEDUCT VALUES.
  CLIMATE/DURABILITY  RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
  OTHER               RELATED DISTRESSES =   0.00 PERCENT DEDUCT VALUES.
```

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13. SUPPLEMENTARY NOTES

14. ABSTRACT

An airfield pavement evaluation was performed in October 2002 at Gray Army Airfield, Fort Lewis, Washington, to develop information pertaining to the structural adequacy of the airfield pavements for continued use under its current mission and the upgrading of the pavements for mission changes. The pavement surface condition was evaluated using the Pavement Condition Index (PCI) survey procedure, and a nondestructive evaluation procedure was used to determine the load-carrying capability of the pavements and overlay requirements for continued use of the pavements under current missions. Results of the evaluation are presented including: (a) a tabulation of the existing pavement features, (b) the results of the nondestructive tests performed using a heavy weight deflectometer, (c) the PCI and rating of the surface of each pavement feature, (d) a structural evaluation and overlay requirements for 1,000 passes of the C-17 aircraft on the fixed-wing pavements and 48,500 passes of the CH-47 aircraft on the rotary-wing pavements, (e) the pavement classification number for each pavement facility, and (f) maintenance and repair recommendations based on the structural evaluation and condition survey.

15. SUBJECT TERMS

Aircraft classification number	Gray Army Airfield	Pavement classification number
Allowable gross aircraft load	Nondestructive testing	Pavement condition index

16. SECURITY CLASSIFICATION OF:			**17. LIMITATION OF ABSTRACT**	**18. NUMBER OF PAGES**	**19a. NAME OF RESPONSIBLE PERSON**
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